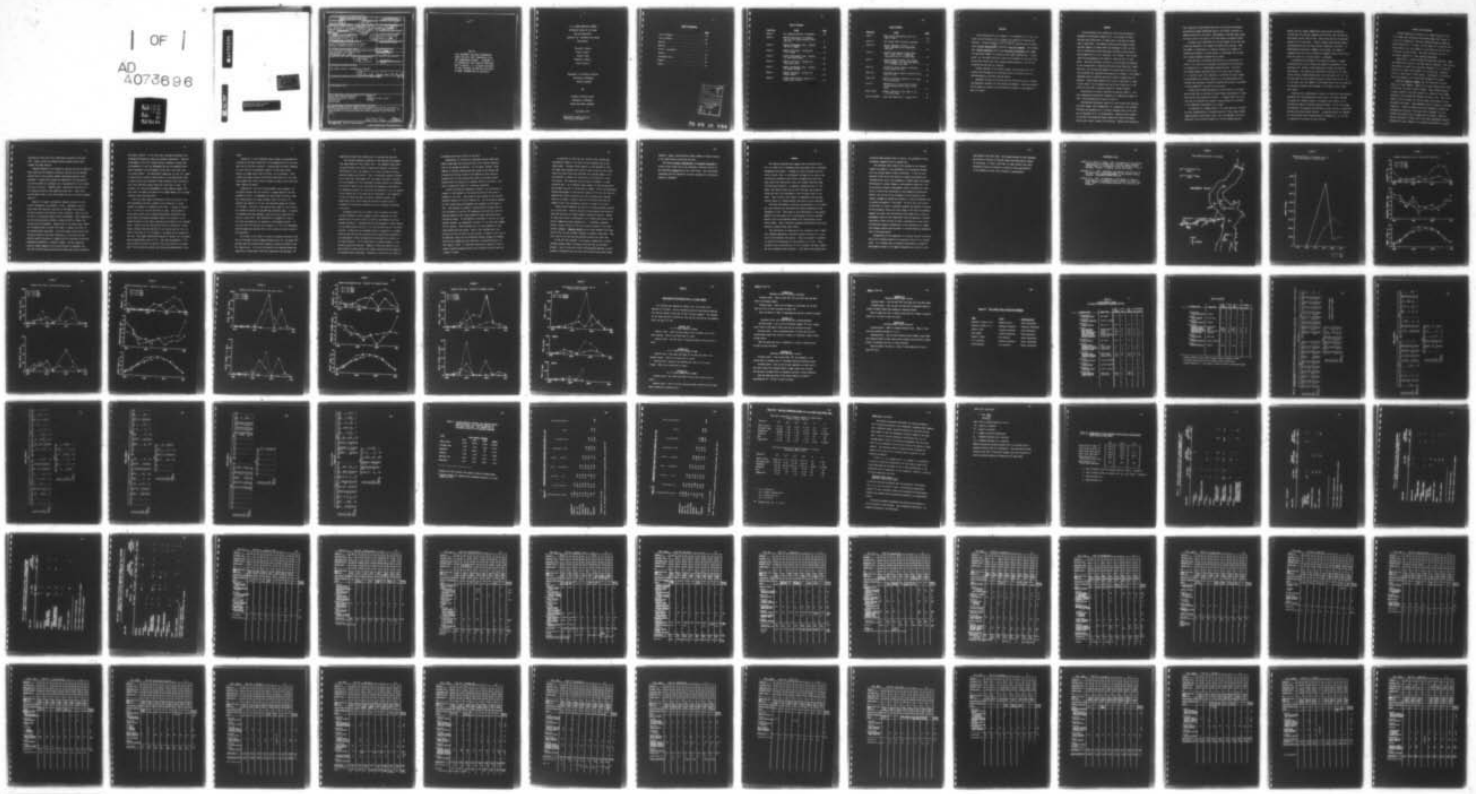
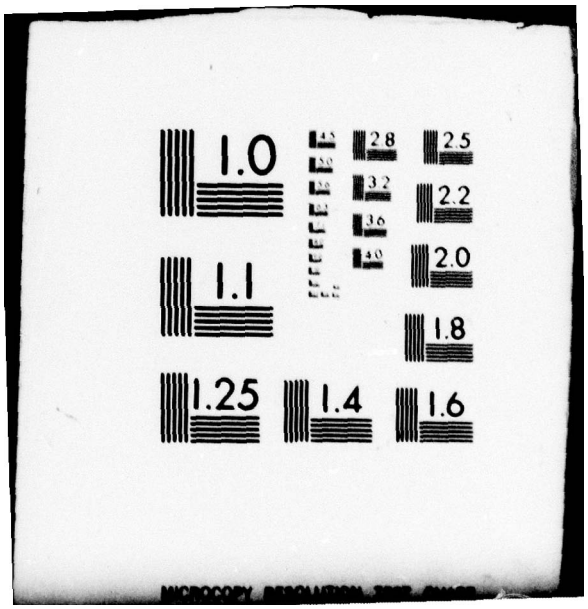
AD-A073 696 MARYLAND UNIV SOLOMONS NATURAL RESOURCES INST F/G 8/8
HYDROGRAPHIC AND ECOLOGICAL EFFECTS OF ENLARGEMENT OF THE CHESA--ETC(U)
SEP 73 M H TAYLOR, R W SMITH, L M KATZ DACW61-71-C-0062
UNCLASSIFIED NL



END
DATE FILMED
10-79
DDC


1.0
1.1
1.25
1.4
1.6
1.8
2.0
2.2
2.5
2.8
3.2
3.6
4.0

SECURITY CLASSIFICATION OF THIS PAGE (When Data Entered)

REPORT DOCUMENTATION PAGE

READ INSTRUCTIONS BEFORE COMPLETING FORM

1. REPORT NUMBER: Appendix VII (6)
2. GOVT ACCESSION NO. (and)
3. RECIPIENT'S CATALOG NUMBER

4. TITLE (and Subtitle): Hydrographic and ecological effects of enlargement of the Chesapeake & Delaware Canal. A fish survey in the Delaware portion of C & D Canal. (and)
5. TYPE OF REPORT & PERIOD COVERED: Appendix VII. App. 1971-73
6. PERFORMING ORG. REPORT NUMBER

7. AUTHOR(s): (10) Taylor, Malcolm H. Taylor; Smith, Ronal W. Smith; Katz, Lanny M. Katz
8. CONTRACT OR GRANT NUMBER(s): (15) DACW61-71-C-0062

9. PERFORMING ORGANIZATION NAME AND ADDRESS: Dept. of Biological Services, U. of Del. College of Marine Studies, U. of Del.
10. PROGRAM ELEMENT, PROJECT, TASK AREA & WORK UNIT NUMBERS

11. CONTROLLING OFFICE NAME AND ADDRESS: U.S. Army Corps of Engineers Philadelphia District, Customs House, 2nd & Chestnut Sts., Philadelphia, Pa. 19106
12. REPORT DATE: (11) Sep[illegible]73
13. NUMBER OF PAGES: 75

14. MONITORING AGENCY NAME & ADDRESS (if different from Controlling Office): (12) 84p.
15. SECURITY CLASS. (of this report): Unclassified
15a. DECLASSIFICATION/DOWNGRADING SCHEDULE

16. DISTRIBUTION STATEMENT (of this Report):
For public release ; distribution unlimited
(9) Final rept. Mar 71-Aug 73

17. DISTRIBUTION STATEMENT (of the abstract entered in Block 20, if different from report)

18. SUPPLEMENTARY NOTES

19. KEY WORDS (Continue on reverse side if necessary and identify by block number)

White perch (Morone Americana)
Weakfish (Synoscion regalis)
Striped bass
Fish survey
Fishes
Chesapeake & Dela. Canal
Delaware

20. ABSTRACT (Continue on reverse side if necessary and identify by block number)

Bottom dwelling fish were sampled in the Delaware part of the C & D Canal system from March 1971 to August 1973 exclusive of January and February. The most abundant of 33 species found were perch, weakfish, striped bass and spot.

407036

DD FORM 1 JAN 73 1473 EDITION OF 1 NOV 65 IS OBSOLETE

SECURITY CLASSIFICATION OF THIS PAGE (When Data Entered)

C & D CANAL ECOLOGICAL SURVEY

Biological Survey of the Canal and its Approaches

Appendix VII - Delaware Fish Survey

Final Report

Malcolm H. Taylor

Ronal W. Smith

Lanny M. Katz

Franklin C. Daiber

Victor Lotrich

Department of Biological Sciences

University of Delaware

Newark, Delaware

and

College of Marine Studies

University of Delaware

Newark and Lewes, Delaware

September, 1973

Table of Contents

List of Figures

List of Tables

Abstract

Bottom dwelling fish were sampled in the Delaware part of the C & D Canal system from March 1971 to August 1973 exclusive of January and February. The most abundant of the 33 species collected were the white perch (Morone americana) and the weakfish (Cynoscion regalis). The striped bass (Morone saxatilis) and the spot (Leistomus xanthurus) were caught in significant numbers in spring and late summer respectively. Of this group, only the white perch was a year-round resident in the Canal area. Striped bass utilize the Canal during spawning migration, and the two sciaenids use the area as a nursery.

Stomach analysis of six species suggest that invertebrates are a primary food source and that the Canal itself contributes little to the maintenance of the fish captured there.

Abundance of fish in the study area was found to be highly variable and apparently declined over the three years sampled. These observations are discussed in relation to the potential influence of enlargement of the C & D Canal.

METHODS

Field operations were carried out aboard the University of Delaware's R/V Wolverine using a 30 ft. otter trawl (3" mesh). The nets were fitted with a 1" mesh liner in the bag to prevent loss of small fish. Ten monthly collections were made at eight stations (Figure 1) between March and December in 1971 and 1972. Two 0.5 statute mile trawls were made routinely at each station, towing speed was 3-4 m.p.h. relative to the current. The net was towed with approximately one fathom of cable per foot of water depth. This was sufficient to keep it on the bottom, as evidenced by the accumulation of substrate and debris from individual trawls. Initially, one tow was made against the current and one with, but this procedure was terminated when analysis of numbers of individuals captured in tows in opposite directions showed no significant differences. Since working against the current is desirable in terms of boat safety, this procedure was used in the latter part of the study for both tows on stations exposed to strong currents.

Descriptions of station locations are given in Table I. Project limitations necessitated termination of sampling in August of 1973. Field personnel are listed in Table II.

Environmental parameters measured at each station were salinity dissolved oxygen, water temperature, air temperature, and turbidity. Turbidity was measured with a 1/2 meter diameter white Secchi disc and is expressed in cm. to disappearance. Duplicate water samples for salinity and dissolved oxygen content were taken from Nansen bottle casts within 3 meters of the bottom. Salinity was calculated

from conductivity measurements made with an induction salinometer, and dissolved oxygen measurement made by the Winkler technique on samples preserved in the field. Measurements of pH were made during the first year of the study in the field using a portable pH meter.

In almost every individual tow the fork length of all fish captured were measured to the nearest millimeter and recorded. When the number of individuals of a species captured in a single tow exceeded one hundred, the total number of individuals was recorded and a random subsample measured and recorded.

When possible, one-hundred individuals of a species were returned to the laboratory and weighed and measured to provide data for computation of a length-weight regression line. From this data length-weight regression lines of the form log wet weight = a + b log fork length were computed by the method of least squares. It was assumed that seasonal variation in the length-weight relationship was negligible and monthly samples were pooled to establish a single regression equation for each species.

Monthly fish biomass estimates for each station for six major species were made by solving the length-weight relationship for each fish captured and summing the results. In samples where the total catch was not measured the computed average weight was attributed to the unmeasured individuals in the sample.

To determine if resident fauna of the canal area were utilized as food, representatives of dominant species of fish caught during regular monthly collections in May, June, and September 1972 were preserved in 10% buffered formalin for future stomach analysis.

Species and size ranges examined were white perch (115-262 mm), striped bass (177-321 mm), weakfish (105-150 mm), spot (120-171 mm), and channel catfish (292-377 mm). White perch was the only species present in all collections. Stomach contents were examined under a dissecting microscope and when possible identified to species. If identifiable invertebrate fragments were present, the number of organisms eaten was based on duplicate fragments present which could only have come from a certain number of organisms.

An analysis was performed to determine the amount of simple correlation which exists between the numbers of individuals of six important fish species, water temperature, oxygen concentration and salinity. The analysis was performed on the data of all individual stations sampled between April 1971 and August 1972 (N = 117) and also upon the pooled monthly figures of those stations (N = 15). In the latter case the numbers of individuals were totals per month and the physical parameters were averages of the eight stations taken every month.

Since for most combinations of numbers of individuals and physical parameters the correlations were inconclusive, an attempt was made to analyze the combined effects of parameters upon numbers of individuals by means of multiple regression models. As with the single correlations, the analysis was performed on both the data of individual stations and pooled monthly figures. A regression model was computed for each species and the species-specific constants b_1, b_2, b_3, and b_4 computed by the method of least squares.

RESULTS AND DISCUSSION

Monthly sampling was carried out at eight stations in the C & D Canal area from March 1971 through August 1973 (Figure 1). A total of 33 species of fish were captured during the sampling period (Table III). Of these, 15 were ranked as to relative abundance based on the total number of individuals and the frequency of capture for each species. The other 18 species occurred in such small numbers as to make rankings meaningless.

White perch, a common resident estuarine fish (Mansueti, 1960), was ranked first because of its high capture frequency. This species was present in almost all collections (Figures 4, 6, & 8) and appears to be a year-round resident of the study area. Spawning occurs in fresh water in early spring. Individuals of increasing size were present in the collections throughout the summer.

Weakfish, Cynoscion regalis, was the second most abundant species in trawl samples. Nearly all of those captured were young-of-the-year, less than 150 mm in length. These juveniles appear in great numbers in the upper estuary as a result of early summer spawning in the Delaware Bay (Daiber and Smith, 1971). They first appear in July or August at 35-60 mm length and increase in size throughout the summer. Peak abundance occurs in August or September (Figure 2). Unlike the white perch which maintains a significant population in all parts of the study area throughout the year, weakfish are present only in summer and fall months. These two species accounted for almost 90% of the total individuals captured. Striped bass, spot, alewife, eel, hogchoker and anchovy as a group

accounted for only about 5% of individuals captured in 1971 and 1972. Table V shows the average monthly biomass and the total biomass for these species.

Computed biomass for six species by station is given in Table IV. White perch was the dominant contributor and was the only species present with a total monthly biomass consistently greater than 5 kilograms. Striped bass biomass was important in the spring when they were present for spawning, but it was generally low and erratic the rest of the year. Weakfish made a significant contribution to the biomass during the late summer and early fall. These three species made up 95% of the total biomass for the six species examined (Table V).

Figures 3-8 suggest considerable temporal variation in both physical parameters and abundance of fish. Although pH and turbidity were also measured, they are not included in the figures because no pattern was detected in their variation. These data are included in the monthly summary tables (XIV-XXXIX). Water temperature was the most consistent variable, reaching 25-26°C in August and falling to 6°C by December. Temperatures in the Canal proper tended to be slightly lower in winter and higher in summer than those in the Delaware River approaches. Dissolved oxygen concentrations were inversely related to the water temperature, as would be expected. Month-to-month fluctuation of oxygen within the seasonal pattern was sometimes attributable to climatic changes. The low oxygen and salinity levels observed at all three stations in September 1971, July 1972 and 1973 were associated with fresh water runoff resulting

from heavy rainfall. In the 1971 case, localized flooding in the Wilmington-Philadelphia region was probably responsible. Tropical storm Agnes in June 1972 caused extreme increases in runoff into the headwaters of both the Chesapeake Bay and the Delaware River, which influenced the environmental conditions in the Canal area for several months. The third major oxygen sag, in July 1973, again occurred after a period of rainy weather in the Philadelphia area. A foamy scum was also observed at upper Delaware River stations in July, when dissolved oxygen levels were less than 4.0 mg/l. The unusually low salinity measurements of these samples suggest that land runoff was again the source of the oxygen demand, but no single causative event was identified.

Since the Canal enters the Delaware River in the area of the salt-freshwater interface, salinity can be expected to change rapidly in response to changes in river flow. A change of several ppt. occurred with the ebb and flood of tides. The extremes of fresh water runoff which occurred unpredictably during the study period mask an underlying seasonal variation in salinity in the Delaware portion of the Canal, and associated regions of the Delaware River. Based on the two and one-half years of observation in this study, salinity would be expected to rise during June and July to a peak of less than 10 °/oo in August or September before dropping in the fall. The highest salinities observed at station 109, nine miles west of Reedy Point, were 7-8 °/oo. This was approximately 1 °/oo greater than at station 113 which is four miles north of the Canal, and 1 °/oo less than at station 115, about the same distance to the

south.

Figures 4, 6, and 8 summarize trawl catches at representative stations in the Canal proper and in the Delaware River to the north and south of the Canal entrance. Although month-to-month variation in catch size was considerable, numbers of fish were clearly greater in summer months than in winter, at all stations. Total catches for eight stations in the March collections over the three years ranged from 43-193, while in August as many as 8418 fish were taken (Tables XIV-XXXIX).

Comparison of the trawl and hydrographic data suggests a relationship between very low salinity or oxygen depletion and the movements of fish. In September 1971 when runoff from heavy rains was concentrated in the upper Delaware River, at station 113, salinity was reduced to 0.1 ppt. and dissolved oxygen was reduced to 3.58 mg/l. Few fish of any species were caught at this station, but catches at station 115 and 109 were unusually large. At station 115 weakfish were most abundant, while white perch dominated the catch at station 109. This distribution is suppertive evidence for short-term migration in response to environmental stress. In July 1972 and 1973 the fish catch (Figure 4, 6, 8, 9) was depressed, and this again was probably due to fish leaving the area because of low salinities.

The results of the simple correlation analyses performed on the data of individual station samples between April 1971 and August 1972 and also upon the pooled monthly figures are shown in Tables VI and VII respectively. Of the six fish species only weakfish showed any significant correlations, these with temperature and salinity. No

significant interactions between pairs of species was detected.

The multiple regression analyses of the weakfish and hogchoker have some predictive value (Table VIII). The weakfish model based on pooled monthly data showed a significant multiple correlation coefficient of 0.92, due largely to the close correlation between weakfish numbers and salinity. Thus, the multiple regression models do not offer much improvement over the simple correlation analyses. With the exception of the relationship between salinity and weakfish, the observed values of the three physical parameters considered do not adequately explain the occurrence and abundance of the six species in the eastern end of the Canal and its approaches. The suggestion is that the usual extremes of salinity, dissolved oxygen, and temperature in the Canal system are within the normal range of tolerances of the species examined and do not influence patchiness in the area.

Averaging trawl data for several stations reduced the month-to-month variation in catch enough to permit comparison of fish populations in the Canal proper to those in the Delaware River approaches (Figure 9). Stations 109-111 were averaged to obtain figures for the Canal proper, while 113, 114, and 116 were used for the river stations. Station 115 was excluded because it generally is a higher salinity area and 112 was excluded because catches there appeared to be influenced by current abnormalities resulting from proximity to the Canal entrance. In all three series of monthly samples, a consistent pattern was observed. Numbers of fish were greater in the Canal proper in spring months, but summer catches were much larger in the Delaware River approaches. Exceptions occurred only in times of

documented poor water quality in the River.

Examination of raw data for individual species (Table XIV-XXXIX) shows that the white perch was by far the most numerous fish in all spring collections. In the summer, however, large numbers of juvenile weakfish and spot moved up the estuary and accounted for as much as 50% of the numbers at river stations. Although both of these species were taken in the Canal proper weakfish were not typically as abundant there as they were in the river, probably the result of a salinity preference.

Another observation expressed in Figure 9, is the decline in numbers of fish sampled in the second two years of the study as compared to the first. This trend is also evident in the relative abundance figures for 1971-72 (Table III). All of the major species but the striped bass were markedly less abundant in 1972 than in 1971. The increase in numbers of striped bass is attributable to the coincidence of the May 1972 sampling period with the period of spawning migration when large numbers of these fish were moving through the Canal. No information is available to account for this decline; however, on examination of Table V, it is seen that biomass did not decline. This indicates that the size frequency of fish being sampled was increasing. Table V also includes data from stations 112 and 115 which are not included in Figure 9, and this is an important reason for the difference between biomass and numbers. Tropical storm Agnes may well have been a contributing factor in 1972 (Taylor, 1972). If 1972 year classes were reduced by loss of young or partial spawning failure this influence could be felt for a number of years.

As indicated in Table IX, the relative total catches were consistently higher at the three up-river stations than in the Canal proper. Although actual numbers of fish declined in 1972, the Canal catch remained about 60% as large as that for the River. Since 1973 collections were available only through August, it is not possible to compare all three years of the study on a total catch basis. The comparison through August is subject to large variation due to the relatively large numbers of fish moving within and through this part of the estuary in summer. Since the differences between percentages for the partial seasons of 1971 and 1972 were not apparent when total catches for the full 10 months were compared, there is no reason to suspect that the 1973 figure indicates any change in Canal fish population relative to those in the river.

Tables X-XIII summarize the results of stomach analysis carried out in this study. Fourteen species of invertebrates were found to have been eaten by the fishes examined during this period. Twelve of these were benthic invertebrates, all of which were found in the benthic sampling program (Appendix IV). In addition, copepods, insects, insect larvae and fish were found in several of the individuals examined. Gammarus daiberi was the most abundant food item, and was also the most abundant organism in benthic collections. However, none of the fish species appeared selective in their diet.

Of the 340 fish examined, 54 had empty stomachs with a proportionately higher number occurring in May and June at the Canal station. Also, 59 fish had totally unrecognizable material in their stomachs, indicating that they had eaten several hours before being

captured. Again, proportionately higher numbers of these occurred at the Canal station during May and June.

The species Crangon septemspinosa and Neomysis americana occurred as food items only in the September collection except for one individual Neomysis which was found in May. This observation correlates with the appearance of these organisms in invertebrate samples in September.

SUMMARY

The results presented here suggest that the eastern end of the C & D Canal and its Delaware River approaches form a relatively homogeneous environment. Although the Canal and River have different sources, there is considerable exchange at the eastern end and physical parameters were similar throughout the study area. Some trends were observed but tidal and climatic variation made interpretation difficult. In general, salinities were 1-2 °/oo higher near Reedy Island than at other stations, and dissolved oxygen was most often depressed at river stations north of the Canal. Canal stations were subject to temperature fluctuations several tenths of a degree greater than those at river stations.

The small differences in physical characteristics of the Canal and river stations are associated with subtle gradations in the abundance of fish. There were no clear differences in the species makeup of the two areas, but it was apparent that the transient species such as the weakfish tended to be concentrated in more saline waters. They temporarily retreated from stations which were exposed to unusual fresh water runoff.

This association is supported by the correlation matrix (Table VII) relating temperature, dissolved oxygen and salinity to occurrence of the dominant fish species. Only the relation of weakfish to salinity was significant in this analysis ($r = 0.92$). Other variables such as availability of food, currents, and water quality may have influenced fish movements. Since many of the species con-

sidered in this analysis move in schools, the influence of such extraneous variables would be significant.

The ecosystem under study in this program is an extremely complex one subject to the influences of two estuarine systems, plus the varying impact of man's activities. It has not been possible in the short time alloted to isolate and quantify the variables which control the movements of fishes within the system. Observations of sudden changes in environmental conditions, such as produced by tropical storm Agnes, serve to document the sensitivity of local fish populations to environmental perturbations. However, the fluctuation in abundance of fish induced by such climatic changes has masked any response to subtle influences, such as gradual enlargement of the Canal. The fact that fluctuations attributable to climatic conditions remained the dominant influence on fish movements during the final stages of the Canal enlargement, suggests any short-term perturbations which might result from the enlargement would be less significant than the apparently frequent occurrence of short periods of heavy contamination by land runoff. Of potentially greater significance to fish population are longer-term changes causing reduced growth or lessened spawning capability over a protracted period.

Documentation of the magnitude of so-called "natural variation" within the ecological system is an important result of the present study. It is evident that no absolute determination of possible environmental impact of the Canal enlargement can be made at this

time based on the field data. The present decline in fish abundance may well be a function of natural rather than man-induced changes of the system. If this is the case, at least several more years observation would be necessary to achieve a first approximation of the baseline on which this variation is superimposed.

REFERENCES CITED

Daiber, F. C. and R. W. Smith. 1971. An analysis of the weakfish population in the Delaware Bay, 1970-1971, Annual Dingell-Johnson Report to the Division of Fish and Wildlife, State of Delaware. Project: F-13-R-13, Job No. I-8, 42 pp.

Mansueti, R. J. 1960. Movements, reproduction, and mortality of the white perch, Roccus americanus, in the Patuxent estuary, Maryland. Chesapeake Science 2:142-205.

Taylor, M. H. 1972. An assessment of the effects of Tropical Storm Agnes on the Delaware estuary; Results of a short term study. Report to Philadelphia District, U.S. Army Corps of Engineers.

FIGURE 1

Fish Sampling Stations in Delaware

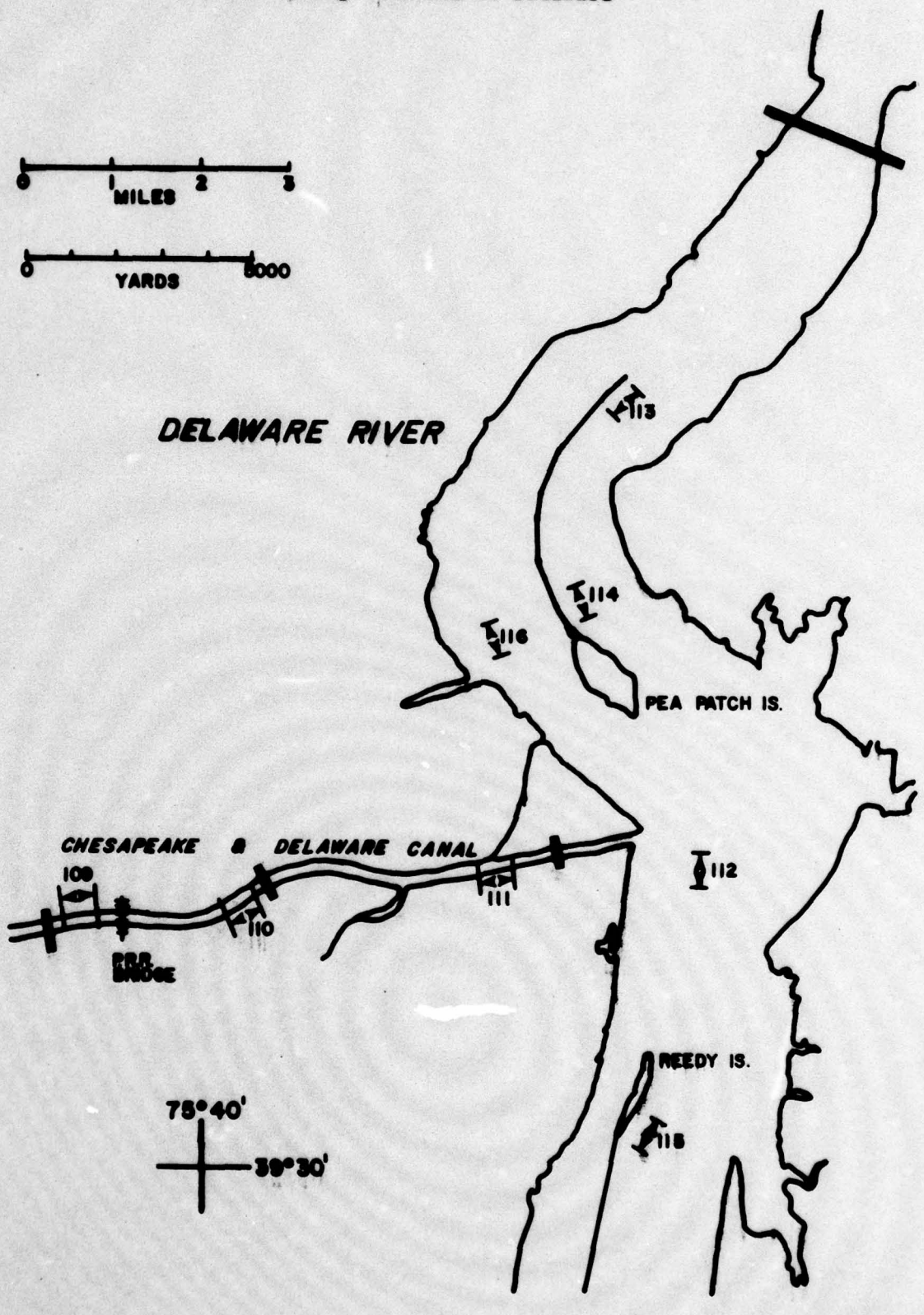


FIGURE 2

Weakfish Populations in Delaware part of
C&D Canal System in 1971 and 1972

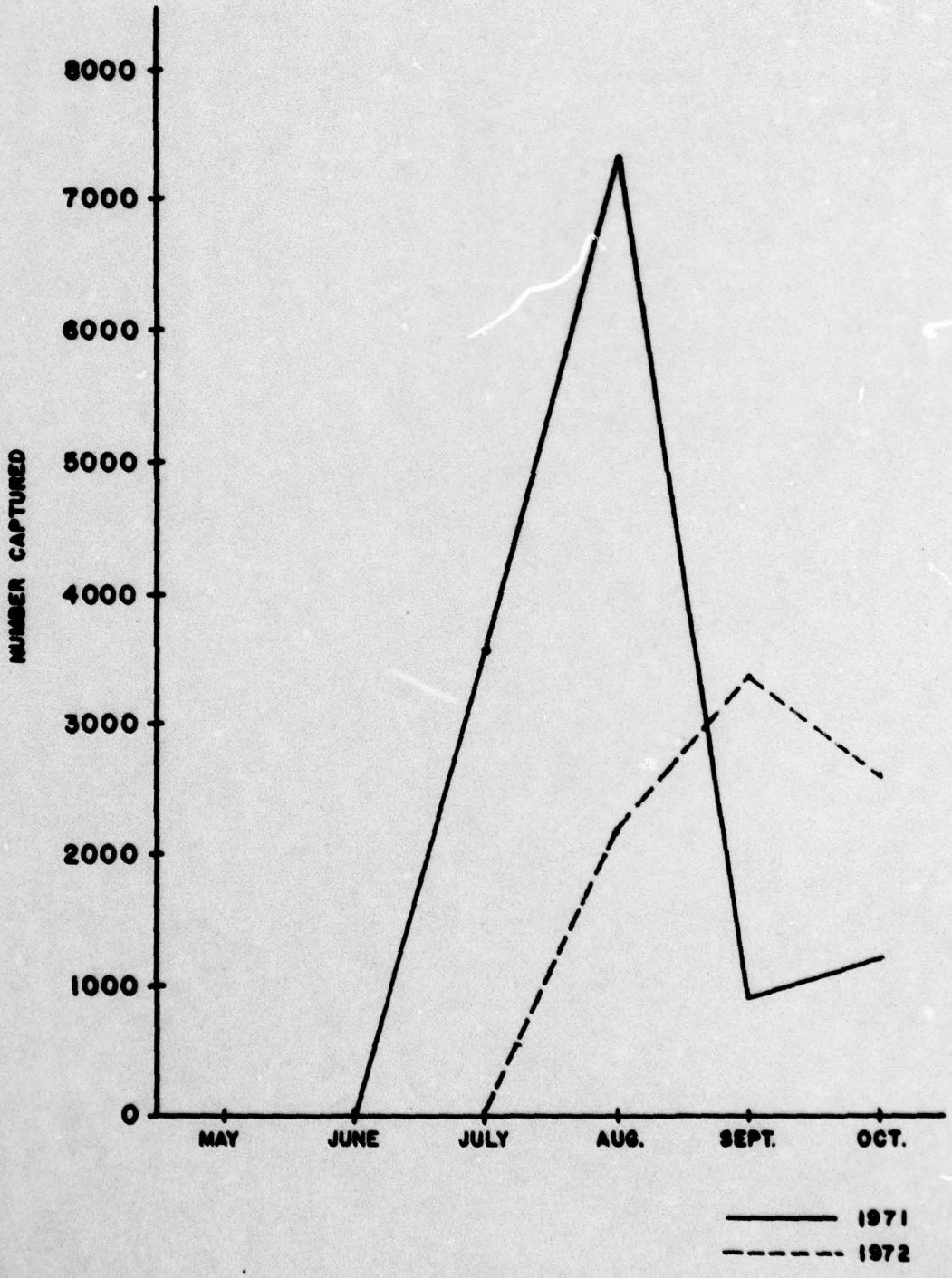


FIGURE 3

Summary Hydrographic Data - Station 109 (C&D Canal)

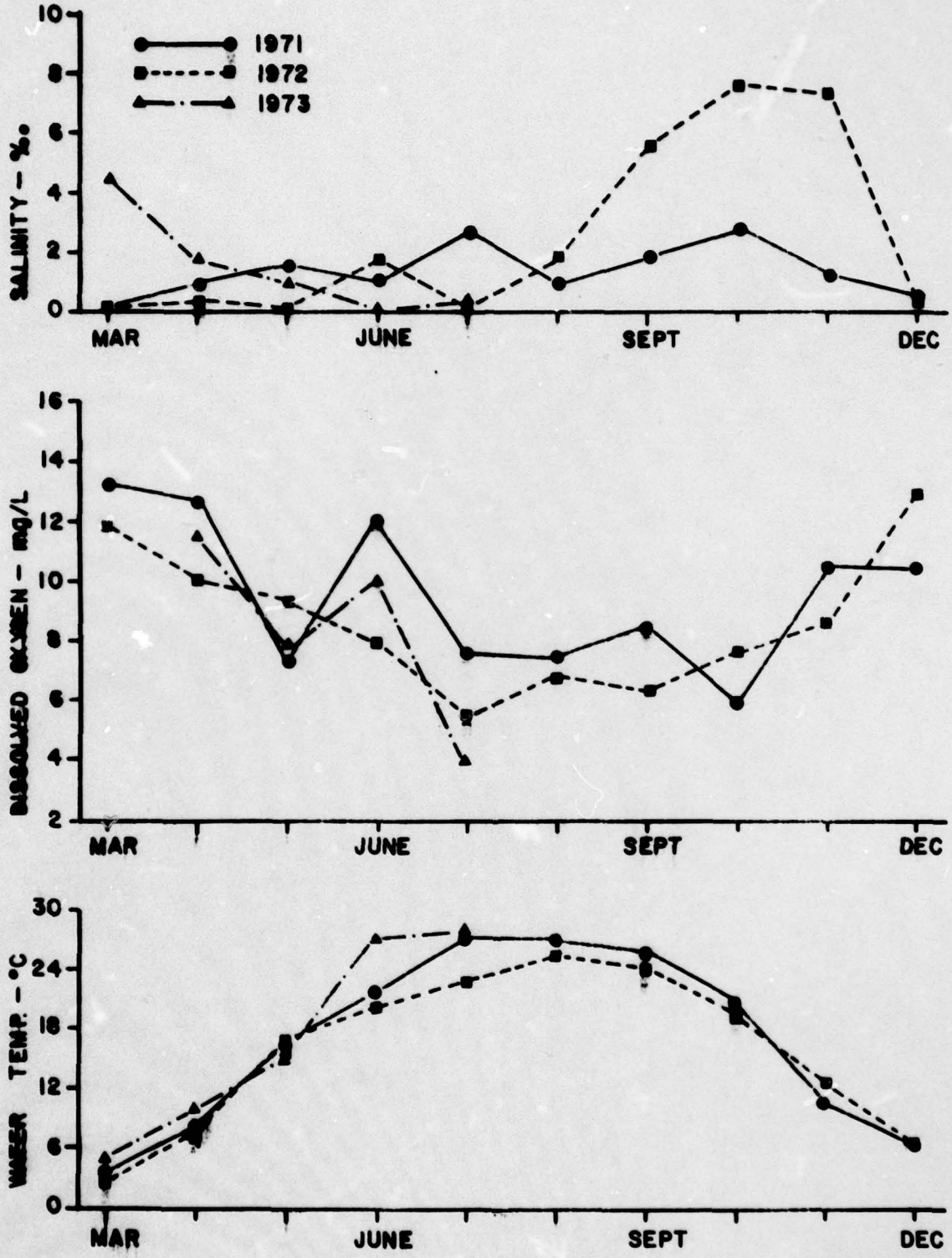
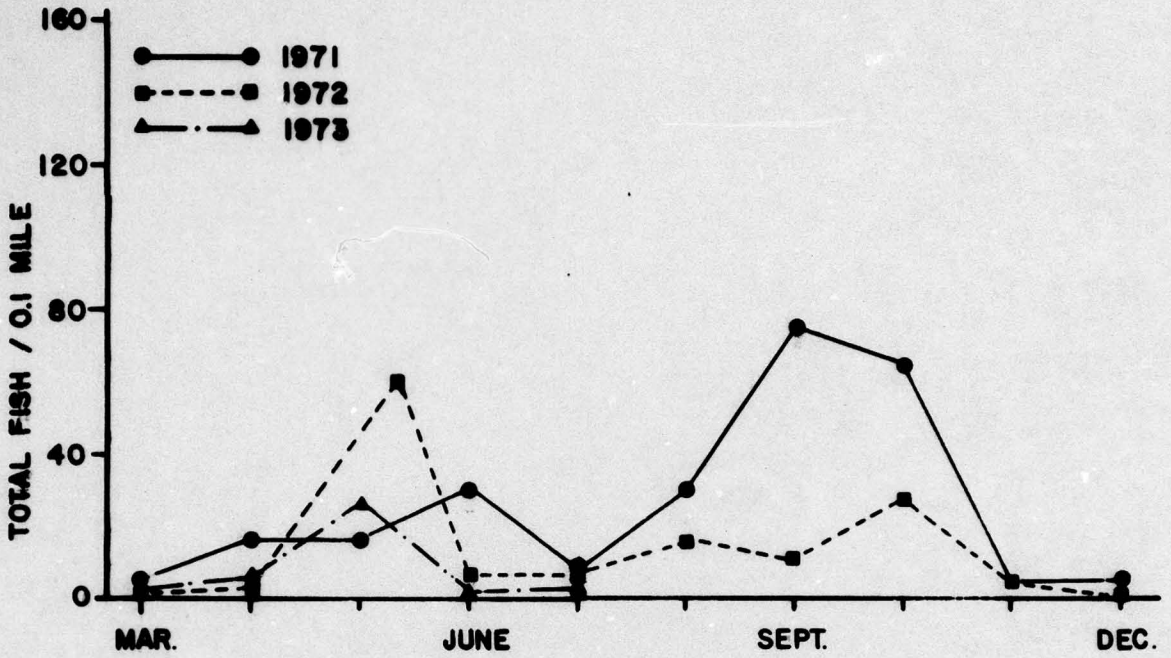


FIGURE 4

Summary Trawl Data - Station 109 (C&D Canal)



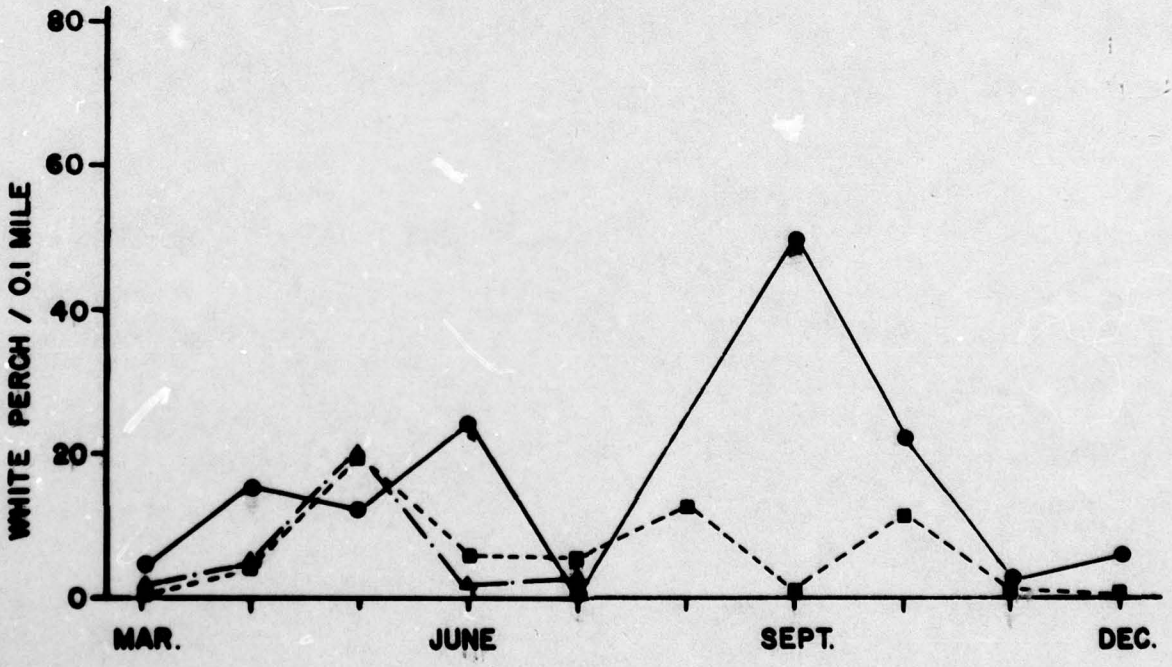


FIGURE 5

Summary Hydrographic Data - Station 113 (Pea Patch Jetty)

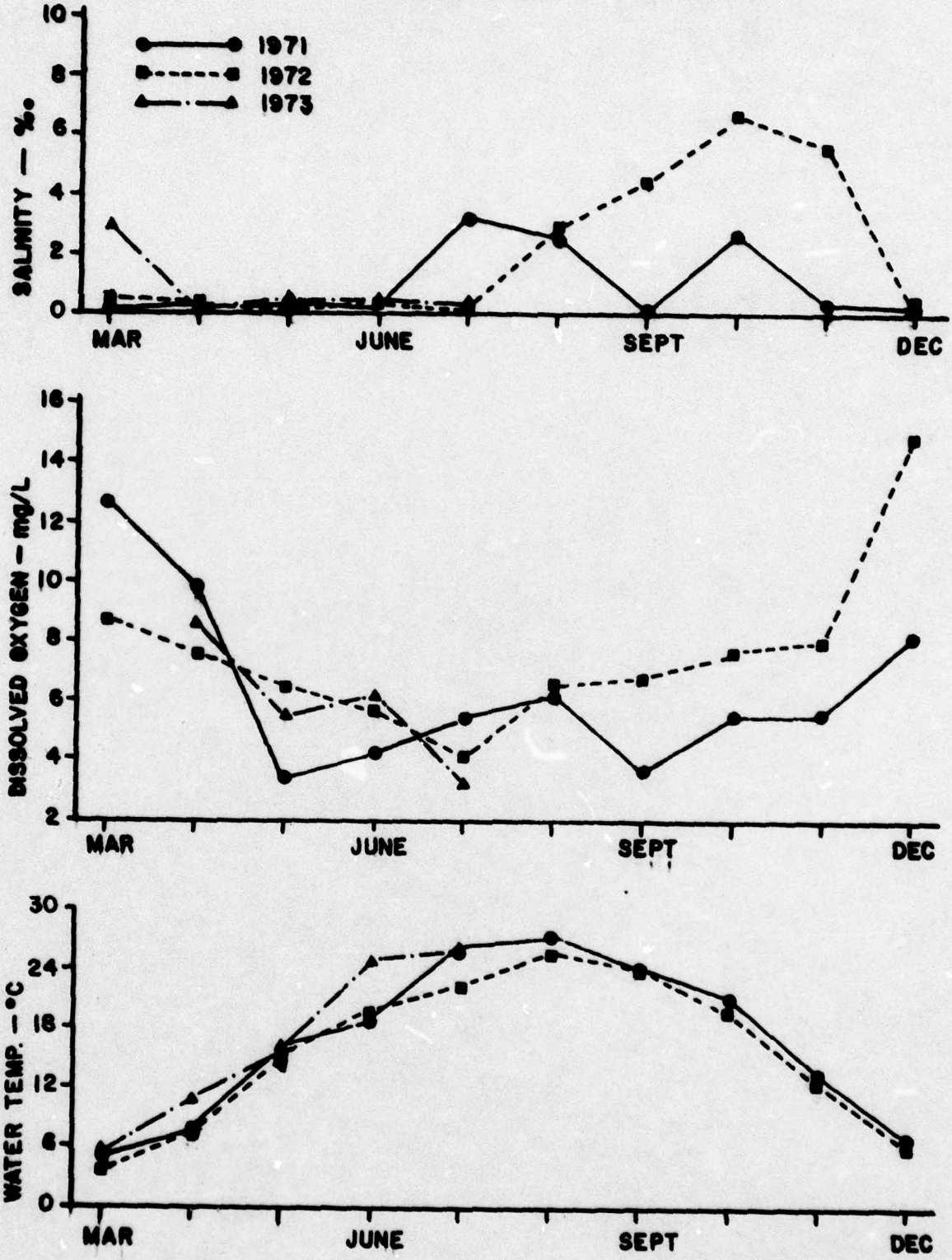
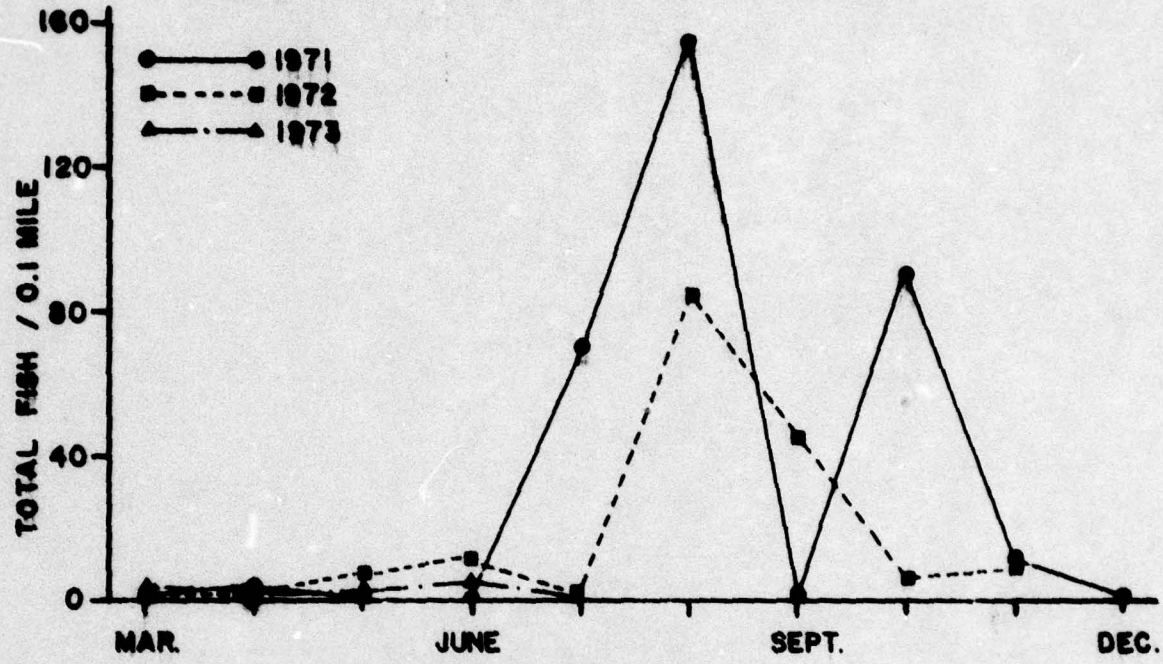


FIGURE 6

Summary Trawl Data Station 113 (Pea Patch Jetty)



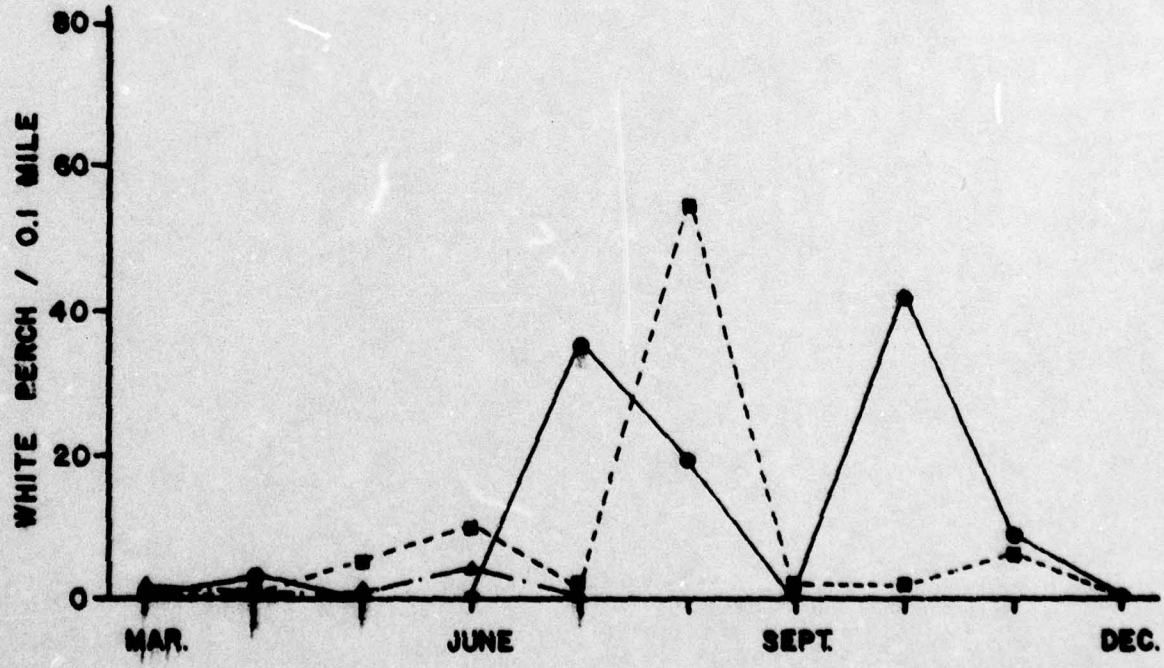


FIGURE 7

Summary Hydrographic Data - Station 115 (Reedy Island)

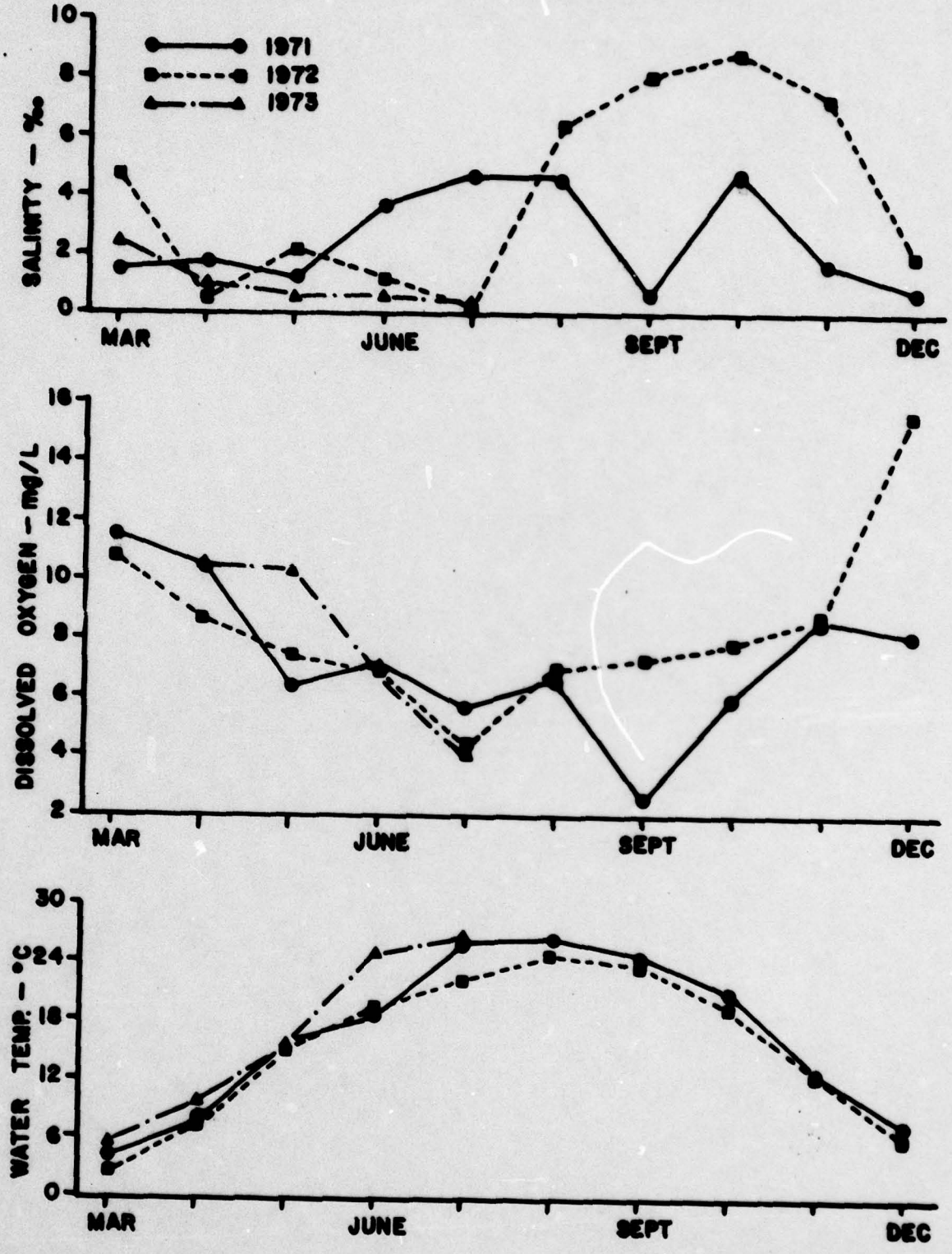
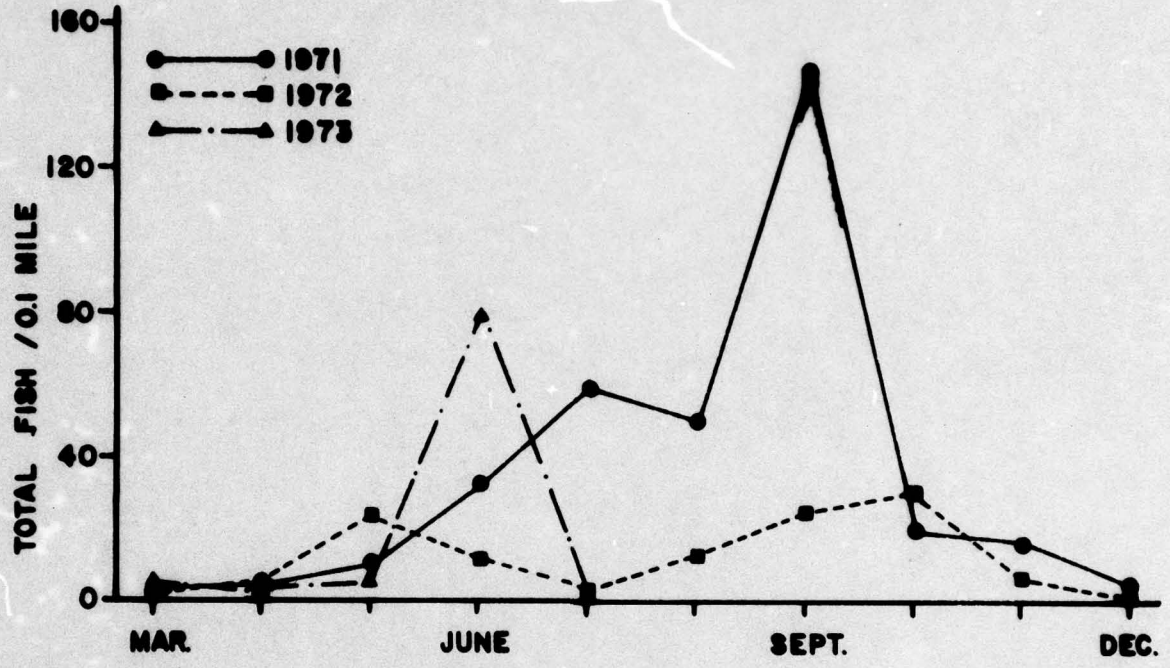


FIGURE 8

Summary Trawl Data - Station 115 (Reedy Island)



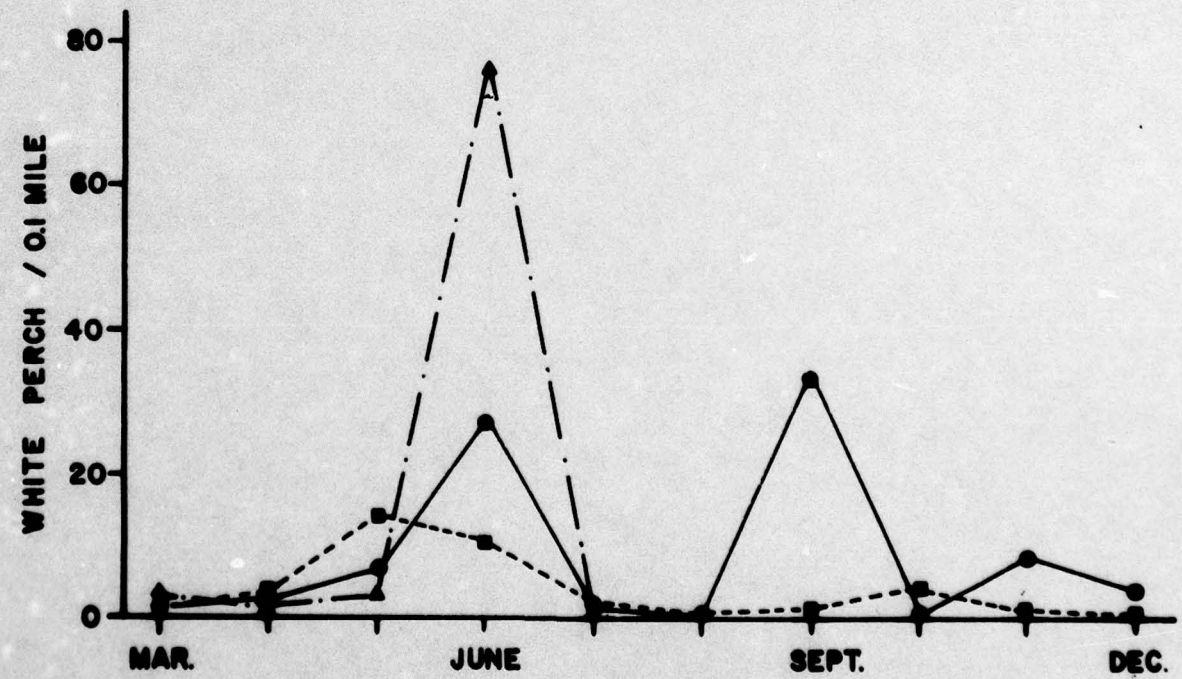


FIGURE 9

Average Trawl Catch in Canal and in River North of Canal

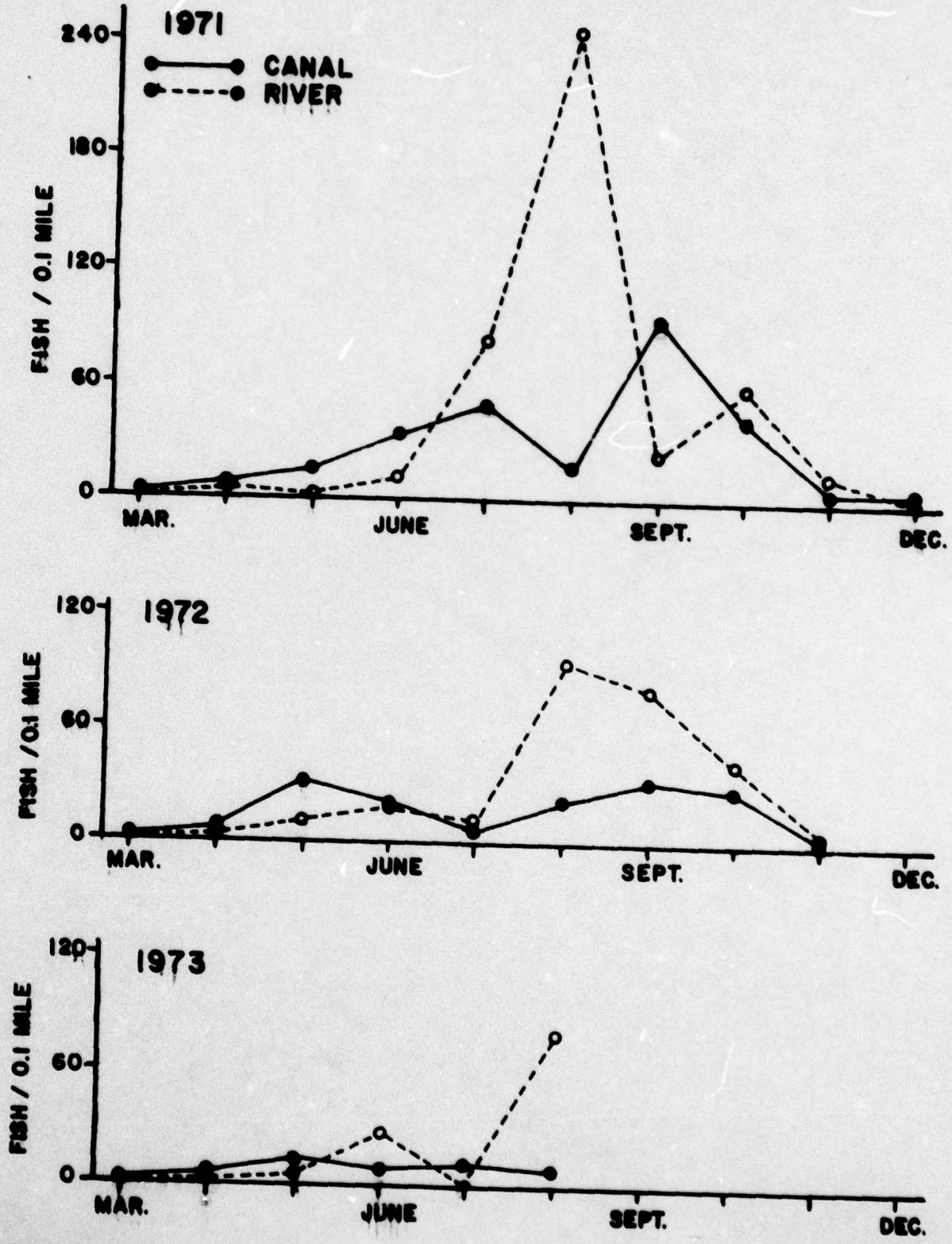


Table I

FISH STATION DESCRIPTIONS FOR C & D CANAL SURVEY

All stations were sampled by towing a 30' otter trawl over a distance of 1/2 mile. The two locations given for each station description are the points at each end of this 1/2 mile transect. For stations in the canal use USC & GS Chart No. 570, and for stations in the Delaware River use Chart No. 294.

STATION 109
(C & D Canal, Railroad Bridge)

Western point - where rip-rap stones start on western end of old canal opening. (This is on North side of canal)

Eastern point - 5th pole West of Railroad Bridge on North side of canal.

STATION 110
(C & D Canal, St. Georges Bridge)

Western point - 2nd light pole West of 2nd fish pier West of St. Georges Bridge. (This is on South side of canal)

Eastern point - abeam of 1st fishing pier West of St. Georges Bridge. (This is on South side of canal)

STATION 111
(C & D Canal, Reedy Point Bridge)

Western point - 4th light pole East of Scott Run on South side of canal.

Eastern point - end of road and rip-rap stones on South side of canal. This is known as Ice House Point.

STATION 112
(Delaware River, C & D Canal entrance)

Northern point - line up buoy "1N" with buoy "2N" from the West side of the ships channel.

Southern point - there are no ranges for this point so the only mark is to be 1/2 mile southwest of buoy "1N".

Tows are made in a depth of approximately 30 feet at mean low water.

STATION 113
(Delaware River, North end of Pea Patch Island Bulkhead)

Northern point - line up end of bulkhead (marker "E") with largest water tower in New Castle (Tower has red top and white bottom).

Southern point - line up bulkhead marker "D" with red and white striped smoke stack (one closest to water) at industrial complex South of New Castle.

Tows are made just East of bulkhead in a depth of approximately 25 feet at mean low water.

STATION 114
(Delaware River, Pea Patch Island)

Northern point - line up bell buoy "7N" with monument on New Jersey side in southern part of Killcohook National Wildlife Refuge.

Southern point - line up end of bush vegetation on North end of Pea Patch Island with Delmarva Power & Light smoke stack (largest red and white striped stack) on Delaware side next to Getty Refinery.

Tows are made just East of Pea Patch Island in a depth of approximately 25 - 30 feet at mean low water.

Table I (Cont'd)

STATION 115
(Delaware River, Reedy Island)

Northern point - line up buoy "5R" with buoy "6R" from West side.

Southern point - line up silo at South end of Augustine Beach in middle of Reedy Island dike opening to Augustine Beach.

Tows are made just East of Reedy Island dike in a depth of approximately 25 - 30 feet at mean low water.

STATION 116
(Delaware River, Getty Refinery)

Northern point - abeam of Diamond Shamrock dock. (This is dock with long trestle leading out to it.)

Southern point - line up lower Bulkhead Shoal channel range light with Delmarva Power & Light smoke stack (largest red and white striped stack) on Delaware side next to Getty Refinery.

Tows are made in slough in a depth of approximately 20 feet at mean low water.

Table II - FISH SURVEY FIELD OPERATIONS PERSONNEL

NAME	TITLE	RESPONSIBILITY
Malcolm H. Taylor, Ph.D.	Research Assoc.	Field Coordinator
Ronald W. Smith, M. S.	Resident Biologist	Fisheries Techniques
Lanny M. Katz	Graduate Assistant	Field Operations
Neal Parker	Graduate Assistant	Field Operations
Thomas H. White	Boat Captain	Vessel Operations
W. F. Carlsten	Utilities Mechanic	Vessel Operations
David Matthews	Boat Engineer	Vessel Operations

TABLE III

SPECIES CAPTURED IN TRAWLS
C & D CANAL AND DELAWARE RIVER APPROACHES, 1971-1973

SCIENTIFIC NAME	COMMON NAME	1971 REL. ABUND.[1]	1971 RANK	1972 REL. ABUND.	1972 RANK	OVERALL RANK[2]
Petromyzontidae						
Petromyzon marinus	Sea lamprey	--- *	---	---	---	---
Acipenseridae						
Acipenser oxyrhynchus	Atlantic sturgeon	---	---	---	---	---
Anguillidae						
Anguilla rostrata	American eel	38.4	9	19.8	9	9
Clupeidae						
Alosa aestivalis	Blueback herring	34.6	11	10.8	13	12
Alosa mediocris	Hickory shad	---	---	---	---	---
Alosa pseudoharengus	Alewife	365.2	4	74.0	5	5
Alosa sapidissima	American shad	---	---	---	---	---
Brevoortia tyrannus	Atlantic menhaden	91.6	8	15.5	12	10
Dorosoma cepedianum	Gizzard shad	---	---	---	---	---
Engraulidae						
Anchoa mitchilli	Bay anchovy	161.3	6	80.0	4	6
Cyprinidae						
Cyprinus carpio	Carp	---	---	---	---	---
Hybognathus nuchalis	Silvery minnow	---	---	---	---	---
Notemigonus crysoleucas	Golden shiner	---	---	---	---	---
Notropis cornutus	Common shiner	---	---	---	---	---
Ictaluridae						
Ictalurus catus	White catfish	2.2	15	2.1	14	14
Ictalurus nebulosus	Brown bullhead	10.4	12	16.1	11	11
Ictalurus punctatus	Channel catfish	69.7	9	46.6	7	8
Belonidae						
Strongylura marina	Atlantic needlefish	---	---	---	---	---
Atherinidae						
Menidia menidia	Atlantic silverside	---	---	---	---	---
Syngnathidae						
Syngnathus fuscus	Northern pipefish	---	---	---	---	---
Percichthyidae						
Morone americana	White perch	7516.1	1	4338.9	1	1
Morone saxatilis	Striped bass	163.5	5	194.3	3	3

TABLE III CONTINUED

SCIENTIFIC NAME	COMMON NAME	1971 REL. ABUND.[1]	1971 RANK	1972 REL. ABUND.	1972 RANK	OVERALL RANK[2]
Centrarchidae						
Lepomis macrochirus	Bluegill	---	---	---	---	---
Percidae						
Perca flavescens	Yellow perch	---	---	---	---	---
Pomatomidae						
Pomatomus saltatrix	Bluefish	---	---	---	---	---
Sciaenidae						
Bairdiella chrysoura	Silver perch	---	---	1.7	15	15
Cynoscion regalis	Weakfish	5962.0	2	2897.1	2	2
Leiostomus xanthurus	Spot	642.9	3	56.4	6	4
Micropogon undulatus	Atlantic croaker	2.6	14	17.2	10	13
Pogonias cromis	Black drum	---	---	---	---	---
Gobiidae						
Gobiosoma bosci	Naked goby	---	---	---	---	---
Triglidae						
Prionotus carolinus	Northern searobin	---	---	---	---	---
Soleidae						
Trinectes maculatus	Hogchoker	127.6	7	38.0	8	7

1. Relative abundance is total number of samples captured x frequency of capture.

2. If average ranks were identical, most abundant species was placed first.

* Species designated by --- were captured in numbers too small to be meaningfully ranked.

TABLE IV. Standing Crop Sampled Biomass (March 1971-August 1973) at Sampling Stations of the C & D Canal Study. All weights are in kilograms rounded to the nearest hundreth.

White Perch

1971

	M	A	M	J	J	A	S	O	N	D
109	2.48	11.68	5.40	7.03	.37	12.23	.06	2.02	1.38	3.98
110	.65	2.00	10.23	5.78	7.20	6.84	2.50	2.31	2.90	1.99
111	.15	1.94	4.28	10.56	2.75	.38	1.87	.50	1.40	1.47
112	2.51	.81	.40	5.72	.66	.14	.15	1.08	2.49	.11
113	.01	2.66	.04	.03	17.55	7.06	-	7.22	3.75	.53
114	.07	1.48	-	.78	18.33	7.01	-	.07	1.78	.01
115	.36	.95	5.19	16.72	.87	.33	-	.46	4.44	.99
116	.47	1.11	.91	11.04	4.39	1.69	7.41	4.68	2.78	2.23
Total	6.70	22.63	26.45	57.66	52.12	35.68	11.99	18.34	20.92	11.31
$\bar{x}$	.83	2.82	3.30	7.20	6.51	4.46	1.49	2.29	2.61	1.41
S.D.	1.04	3.62	3.63	5.52	7.41	4.46	2.58	2.47	1.09	1.32
n(indiv.)	155	367	355	980	827	606	245	326	439	233
$\bar{x}$ pr. Ind.	.04	.06	.07	.05	.06	.05	.04	.05	.04	.04

1972

	M	A	M	J	J	A	S	O	N	D
	X	1.80	14.35	2.76	2.82	4.81	.63	6.60	.88	-
		5.30	8.98	5.63	4.83	2.74	.16	1.05	.41	.24
		3.61	3.13	24.39	.51	4.68	1.28	.35	.60	.34
		1.99	2.88	3.76	2.77	.84	.18	.60	1.57	-
		.31	2.70	7.88	.97	45.54	2.17	2.17	4.78	-
		.03	1.27	19.80	X	22.30	.77	1.57	1.04	-
		.55	13.70	6.14	1.21	.40	2.05	5.03	1.25	-
		4.61	20.47	9.77	12.66	16.46	2.11	.95	1.19	.18
		18.20	67.48	80.13	25.77	97.77	9.35	18.32	11.72	-
		2.27	8.44	10.02	3.68	12.22	.86	2.29	1.39	-
		2.02	7.08	7.87	4.22	15.59	1.17	2.29	1.47	-
		378	720	1293	468	1340	113	245	172	17
		.04	.09	.06	.06	.07	.08	.07	.07	

1973

	M	A	M	J	J	A
109	.39	2.68	18.01	.98	1.62	.31
110	2.26	7.23	3.94	5.44	7.44	.83
111	1.10	3.10	3.98	6.20	2.57	.40
112	1.37	.24	.80	6.88	X	X
113	.45	.01	.52	2.75	-	11.11
114	.31	.88	.63	2.04	.06	13.19
115	.52	.50	2.39	52.04	.03	3.63
116	2.20	.26	11.14	33.44	.31	8.07
Total	8.60	14.40	41.41	109.77	12.03	37.54
$\bar{x}$	.80	2.46	6.24	18.70	2.71	5.40
S.D.	1.07	1.86	5.18	13.72	1.72	5.36
n(indiv.)	166	216	571	2573	238	547
$\bar{x}$ pr. Ind.	.05					

- Indicates no fish were caught

x Indicates station not sampled

TABLE IV (CONT'D.)

Alewife

1971

	M	A	M	J	J	A	S	O	N	D
109	-	.01	-	-	-	-	-	.22	.06	-
110	-	.34	.01	-	-	.03	.06	.11	.07	-
111	-	.30	-	-	-	.04	-	.07	.03	-
112	-	.11	.09	-	-	.14	.08	.08	1.20	-
113	-	.01	-	-	-	.26	.01	.07	.02	.01
114	-	.05	-	-	-	.10	.01	.01	.32	-
115	.17	.03	.17	-	.20	-	-	-	.68	-
116	.16	-	-	-	.04	.05	.08	1.66	1.07	-
Total	.33	.85	.27	-	.24	.62	.24	2.22	3.45	.01
$\bar{x}$	-	.11	-	-	-	.08	.03	.56	.43	-
S.D.	-	.13	-	-	-	.09	.04	.28	.49	-
n(indiv.)	24	29	9	-	3	19	14	94	231	
$\bar{x}$ pr. Ind.	.01	.03	.03	-	.08	.03	.02	.02	.01	

1972

	M	A	M	J	J	A	S	O	N	D
	X	-	.39	-	-	.24	.17	-	.39	-
		.40	.07	-	-	.63	-	.16	.19	-
		.35	.85	.20	-	-	.69	-	.09	-
		.02	.02	.03	-	-	-	-	.21	-
		-	.03	.03	-	-	.17	.23	.41	-
		-	.04	-	-	.37	-	.30	.26	-
		.30	.50	-	-	-	-	.15	.60	-
		.24	.04	-	-	-	.42	-	.37	.01
		1.31	1.94	.26	-	1.24	1.45	.84	2.52	.01
		.16	.24	-	-	-	-	-	.31	-
		.18	.31	-	-	-	-	-	.16	-
		16	18	4	-	23	10	6	83	1
		.08	.10	.06	-					

1973

	M	A	M	J	J	A
109	-	.54	.53	-	-	.04
110	-	1.67	.56	-	.09	.43
111	-	.60	.03	-	-	.23
112	-	.13	.33	-	X	X
113	-	-	.27	.01	-	-
114	-	.16	.26	-	-	.08
115	-	.40	.29	.02	-	-
116	-	-	.02	-	-	-
Total	-	3.50	2.29	.03	.09	.78
$\bar{x}$	-	.44	.29	-	-	.11
S.D.	-	.55	.20	-	-	.16
n(indiv.)	-	21	19	2	1	15
$\bar{x}$ pr. Ind.		.16	.12	.2	.09	

TABLE IV (CONT'D.)

Eel

	1971										1972									
	M	A	M	J	J	A	S	O	N	D	M	A	M	J	J	A	S	O	N	D
109	-	-	-	.28	-	-	-	.21	-	-	X	-	-	-	-	-	-	.10	-	-
110	-	-	.19	.39	.11	-	.72	.10	.10	-		-	1.34	-	-	-	-	.10	-	-
111	-	-	.10	.10	-	.13	-	-	.10	-		.10	.59	.20	-	-	-	-	-	-
112	-	-	-	.10	-	-	-	-	.12	-		-	-	-	-	-	.13	.38	-	-
113	-	-	-	.09	-	-	-	.15	.90	-		.10	.10	-	-	-	-	-	.12	-
114	.11	-	-	.18	.13	.29	-	.15	.43	.10		-	.22	.02	-	.63	-	.23	.14	.10
115	-	-	.10	.10	.48	-	-	-	.18	-		-	.94	.45	.12	-	-	-	-	-
116	-	-	.27	.10	-	.49	.20	.09	.52	.21		.22	-	.58	.21	-	-	.10	-	-
Total	.11	-	.66	1.34	.72	.91	.92	.70	2.35	.31		.42	3.19	1.25	.33	.63	.13	.91	.26	.10
$\bar{x}$	-	-	-	.17	-	-	-	.09	.29	-		-	.40	-	-	-	-	.11	-	-
S.D.	-	-	-	.11	-	-	-	.08	.30	-		-	.50	-	-	-	-	.13	-	-
n(indiv.)	1	-	6	14	6	8	8	6	21	3		4	20	11	3	8	1	8	2	1
$\bar{x}$ pr. Ind.	.11	-	.11	.11	.11	.11	.11	.11	.11	.11		.10	.16	.11	.11					

	1973					
	M	A	M	J	J	A
109	-	.12	.12	-	-	-
110	-	.15	-	.11	.13	-
111	-	-	-	-	.10	-
112	.09	-	-	-	X	X
113	-	-	.12	-	-	-
114	-	-	-	.22	-	.30
115	-	-	-	.70	-	.10
116	.63	-	-	.41	-	.11
Total	.72	.27	.24	1.44	.23	.51
$\bar{x}$	.36	-	-	-	-	-
S.D.	.38	-	-	-	-	-
n(indiv.)	8	2	2	15	2	5
$\bar{x}$ pr. Ind.		.13	.12	.10	.12	

TABLE IV (CONT'D.)

Hogchoker

	1971										1972									
	M	A	M	J	J	A	S	O	N	D	M	A	M	J	J	A	S	O	N	D
109	-	-	.23	.54	-	.10	.04	-	.18	-	X	-	.22	.15	.06	-	.27	.31	.01	-
110	-	-	2.02	.29	.01	.06	.16	.10	.04	.02		-	2.48	.61	.06	-	-	.20	-	-
111	-	-	.84	.24	.02	.01	.02	.09	.18	.04		-	.13	.02	-	.70	-	-	-	-
112	-	-	-	.07	-	-	-	.09	.02	-		-	-	.02	-	-	-	.03	-	-
113	-	-	-	.01	-	-	-	.02	-	-		-	-	-	-	-	-	-	-	-
114	-	-	-	-	.01	-	-	.07	-	-		-	-	-	-	-	-	-	-	-
115	-	-	.37	.04	-	-	-	.20	-	-		-	-	-	-	-	-	.02	-	-
116	-	-	.02	.21	.01	-	.04	.03	.01	-		-	-	.05	-	-	.03	.09	.01	-
Total	-	-	3.48	1.40	.05	.17	.26	.60	.43	.06		-	2.83	.85	.12	.70	.30	.65	.02	-
$\bar{x}$	-	-	.44	.18	-	-	-	.06	.08	-		-	-	.11	-	-	-	.08	-	-
S.D.	-	-	.70	.18	-	-	-	.08	.05	-		-	-	.21	-	-	-	.12	-	-
n(indiv.)	-	-	131	53	5	10	11	17	19	3		-	70	42	4	2	16	22	2	-
$\bar{x}$ pr. Ind.	-	-	.03	.03	.01	.02	.02	.04	.02	.02		-	.04	.02	.03					

	1973					
	M	A	M	J	J	A
109	-	-	.02	.01	-	-
110	-	-	-	.13	.01	-
111	-	-	.10	.04	-	-
112	-	-	-	-	X	X
113	-	-	-	.02	-	.01
114	-	-	-	-	-	-
115	-	-	-	.02	-	-
116	-	-	.03	.04	-	.07
Total	-	-	.15	.26	.01	.08
$\bar{x}$	-	-	-	.03	-	.04
S.D.	-	-	-	.04	-	.04
n(indiv.)	-	-	6	9	1	6
$\bar{x}$ pr. Ind.			.03	.03	.01	

TABLE IV (CONT'D.)

Weakfish

	1971										1972									
	M	A	M	J	J	A	S	O	N	D	M	A	M	J	J	A	S	O	N	D
109	-	-	-	-	.06	.06	1.07	.98	-	-	X	-	-	-	-	.05	.58	1.81	.02	-
110	-	-	-	-	.11	.06	1.87	.85	.01	-		-	-	-	-	.52	5.60	6.96	-	-
111	-	-	-	-	.21	.12	1.54	.95	.16	-		-	-	-	-	1.64	2.22	.81	-	-
112	-	-	-	-	.14	.31	.02	1.92	.12	-		-	-	-	-	25.64	3.73	9.66	.01	-
113	-	-	-	-	.31	.48	-	1.88	.03	-		-	-	-	-	11.05	7.89	9.35	-	-
114	-	-	-	-	.21	.74	-	2.05	-	-		-	-	-	-	62.73	8.35	4.37	-	-
115	-	-	-	-	.86	.77	-	3.27	.15	-		-	-	-	-	.82	6.13	5.56	.10	-
116	-	-	-	-	.39	.28	.19	.51	.09	-		-	-	-	-	.33	17.45	12.51	.10	-
Total	-	-	-	-	2.29	2.82	4.69	12.41	.56	-		-	-	-	-	102.78	51.95	51.03	.23	-
$\bar{x}$	-	-	-	-	.28	.35	.59	1.55	.07	-		-	-	-	-	12.85	6.49	6.38	-	-
S.D.	-	-	-	-	.26	.29	.79	.90	.07	-		-	-	-	-	22.03	5.17	4.04	-	-
n(indiv.)	-	-	-	-	1158	366	357	547	34	-		-	-	-	-	2192	3363	2476	17	-
$\bar{x}$ pr. Ind.	-	-	-	-	.0020	.0079	.0131	.0227	.0165	-		-	-	-	-					-

	1973					
	M	A	M	J	J	A
109	-	-	-	-	-	-
110	-	-	-	-	-	.05
111	-	-	-	-	-	.14
112	-	-	-	-	-	X
113	-	-	-	-	-	-
114	-	-	-	-	-	.09
115	-	-	-	-	-	.57
116	-	-	-	-	-	.41
Total	-	-	-	-	-	1.09
$\bar{x}$	-	-	-	-	-	.15
S.D.	-	-	-	-	-	.20
n(indiv.)	-	-	-	-	-	219
$\bar{x}$ pr. Ind.	-	-	-	-	-	

TABLE IV (CONT'D.)

Striped Bass

1971

	M	A	M	J	J	A	S	O	N	D
109	.24	2.00	.97	.10	.04	-	.06	.06	-	-
110	.33	.02	2.32	.08	.22	-	.30	-	-	-
111	-	-	-	.80	-	.08	-	-	-	-
112	-	-	-	.31	.14	.60	.19	.08	.01	-
113	-	-	.04	.09	.33	2.92	-	2.89	.21	-
114	.38	-	-	.11	-	2.45	.04	.07	-	-
115	.02	.05	.36	1.63	-	.49	-	-	-	-
116	.08	.02	-	.79	.02	.71	-	1.08	.21	-
Total	1.05	2.09	3.69	3.91	.75	7.25	.59	4.18	.43	-
$\bar{x}$	.13	-	X	.49	.09	.91	-	.52	X	-
S.D.	.16	-	X	.55	.12	1.14	X	1.02	X	-
n(indiv.)	14	6	24	92	8	93	8	36	4	-
$\bar{x}$ pr. Ind.	.075	.35	.15	.043	.094	.078	.074	.11	.11	-

1972

	M	A	M	J	J	A	S	O	N	D
	X	.09	56.17	.05	-	.03	-	-	.46	-
		.14	8.16	.77	-	-	-	-	-	-
		.89	1.26	.46	.02	-	-	-	-	-
		.25	.58	.28	.26	-	.22	-	-	-
		-	.48	.41	-	-	.36	.38	.71	-
		-	-	-	X	.20	.43	-	-	-
		-	8.16	.11	.01	-	-	-	.34	.04
		1.70	-	1.78	.19	.88	.72	.30	.06	-
		3.07	69.81	3.80	.48	1.11	1.73	.68	1.57	.04
		.38	8.73	.48	X	-	-	-	-	-
		.61	19.36	.58	X	-	-	-	-	-
		13	345	22	5	8	5	2	5	1
		.24	.21	.18	.096					

1973

	M	A	M	J	J	A
109	-	1.42	.50	-	-	-
110	.30	2.29	5.69	-	-	-
111	.38	.94	1.04	.09	.04	-
112	-	.02	.26	.03	X	X
113	.01	1.31	.93	.01	-	.09
114	-	.02	-	-	-	-
115	-	.57	.24	-	-	.99
116	-	1.26	.28	.22	-	.29
Total	.69	7.83	8.94	.35	.04	1.37
$\bar{x}$	-	.97	1.12	-	-	-
S.D.	-	.76	1.88	-	-	-
n(indiv.)	3	24	43	19	1	6
$\bar{x}$ pr. Ind.	.23	-	.21	.018	.04	-

TABLE V. Average monthly standing crop sampled biomass (March-December) for indicated species in C&D Canal study area. All weights are in kilograms rounded to the nearest hundredth.

FISH	MEAN MONTHLY BIOMASS			
	1971	1972	1973[1]	TOTAL
White perch	26.38	36.53	37.29	100.20
Striped bass	2.39	9.14	3.20	14.73
Weakfish	2.28	22.89	X[2]	25.17
Alewife	0.82	1.06	1.12	3.00
American eel	0.80	0.80	0.57	2.17
Hogchoker	0.64	0.61	0.08	1.33

---

1. Figures for 1973 include only months of March through August.

2. Average biomass not computed since weakfish presence is in late summer and fall.

VI

Table VI - CORRELATION MATRIX BASED ON INDIVIDUAL STATION DATA (N = 117)

	TEMPERATURE	SALINITY	DISS. OX.	WHITE PERCH	STRIPED BASS	WEAKFISH	ALEWIFE	EEL	HOGCHOKER
Temperature	1.00								
Salinity	0.48*	1.00							
Diss. Ox.	-0.60	-0.10	1.00						
White Perch	0.18	-0.04	-0.02	1.00					
Striped Bass	0.02	-0.08	0.09	0.14	1.00				
Weakfish	0.35*	0.53*	-0.13	0.08	-0.05	1.00			
Alewife	-0.11	-0.02	.01	-0.03	-0.01	-0.05	1.00		
Eel	0.03	-0.12	-0.09	0.21	.01	0.08	0.17	1.00	
Hogchoker	.00	-0.15	0.31	0.06	0.16	-0.10	-0.06	0.12	1.00

* Significant at .05 level

Note: For explanation of correlation matrix & regression model, see Table VIII.

VII

Table VII - CORRELATION MATRIX BASED ON POOLED MONTHLY DATA (N = 15)

	TEMPERATURE	SALINITY	DISS. OX.	WHITE PERCH	STRIPED BASS	WEAKFISH	ALEWIFE	EEL	HOGCHOKER
Temperature	1.00								
Salinity	0.56*	1.00							
Diss. Ox.	-0.81*	-0.21	1.00						
White Perch	0.33	0.08	-0.07	1.00					
Striped Bass	.01	-0.21	0.07	0.16	1.00				
Weakfish	0.50	0.92*	-0.23	0.02	-0.20	1.00			
Alewife	-0.19	0.03	0.17	-0.17	-0.09	-0.11	1.00		
Eel	.01	-0.23	0.03	0.35	0.51	-0.29	0.80*	1.00	
Hogchoker	-0.06	-0.28	-0.04	0.10	0.39	-0.27	-0.10	0.33	1.00

* Significant at .05 level

Note: For explanation of correlation matrix & regression model, see Table VIII.

Table VIII. MULTIPLE REGRESSION MODELS OF C & D CANAL FISH SURVEY DATA

Multiple Regression Models Based on Individual Station Data (N=117)

Species	b_1*	b_2*	b_3*	b_4*	R	F
White perch	-57.27	5.08	8.16	-11.02	.26	2.39
Striped bass	-24.86	.86	2.75	-2.55	.19	1.24
Weakfish	-76.58	3.18	-.74	52.79	.54**	13.77**
Alewife	14.79	-.38	-.67	.40	.16	.90
Eel	1.45	.01	-.05	-.16	.16	.85
Hogchoker	-25.79	.69	2.77	-1.81	.47**	9.66**

Multiple Regression Models Based on Pooled Monthly Data (N=15)

Species	b_1*	b_2*	b_3*	b_4*	R	F
White perch	-2028.01	71.12	213.38	-118.22	.58	1.82
Striped bass	-295.62	9.25	31.08	-29.41	.39	.64
Weakfish	773.73	-29.59	-117.21	656.22	.92**	21.34**
Alewife	99.49	-3.07	-3.98	8.02	.26	.26
Eel	-10.25	.56	1.67	-2.10	.34	.48
Hogchoker	23.66	.77	.26	-8.45	.30	.37

* b_1 = interval
b_2 = water temperature
b_3 = dissolved O_2
b_4 = salinity

** Significant at .01 level

Table VIII (Continued)

The multiple regression describes the relation between a set of physical parameters (the independent variables water temperature, dissolved oxygen, salinity) measured in the field and the mean number of fish (the dependent variable) caught at the same time. A set of partial regression coefficients (b_2, b_3, b_4) corresponding to each of the physical parameters, plus an intercept (b_1) are generated from the field data by the method of least squares. The analysis yields an equation which estimates the number of fish which can be expected with a given set of the physical parameters:

$$\text{\# fish} = b_1 + b_2 \text{ (temperature)} + b_3 \text{ (oxygen)} + b_4 \text{ (salinity)}$$

A multiple correlation coefficient (R), which may be used as an index measuring the closeness of fit of the observed data to the estimated line of regression, is also computed. Finally, a statistic (F) which describes the ratio:

$$\frac{\text{Regression mean square}}{\text{Residual (error) mean square}}$$

is used to test the hypothesis that the regression coefficients (b_2, b_3, b_4) are all equal to zero. Statistically significant values of R and F indicate a model which explains the relationship between fish numbers and the physical parameters to an appreciable extent.

Correlation analysis determines the direction and degree of joint variation of two variates. The correlation coefficient r is computed according to the following:

Table VIII (continued)

$$r = \frac{\Sigma XY - \frac{\Sigma X \Sigma Y}{N}}{(N-1)S_x S_y}$$

ΣXY = sum of cross-products of x and y

ΣX = sume of x variates

ΣY = sum of y variates

N = number of paired observations

S_x = standard deviation of x variates

s_y = standard deviation of y variates

Simple correlation analyses between pairs of variates are expressed in matrix form for convenience. The correlation coefficients in the body of the matrix express the joint variation of the two variates heading the respective row and column.

Table IX - Comparison of Trawl Catches in Canal and in the Delaware River, North of the Canal.

	1971	1972	1973
Total Catch in Canal (1)	272.8	154.4	---
Total Catch in River (2)	445.9	275.0	---
Canal Catch (Mar-Aug) (3)	125.9	89.6	53.1
River Catch (Mar-Aug) (4)	346.9	142.2	124.6
Canal Catch as % of River Catch (full year)	61%	56%	---
Canal Catch as % of River Catch (Mar-Aug)	36%	61%	43%

1. Sum of fish/0.1 mile for stations 109-111, (March - December)
2. Sum of fish/0.1 mile for station 113, 114, 116, (March - December)
3. Same stations as 1
4. Same stations as 2

Table X. Stomach contents of white perch, Morone americanus, caught in the C&D Canal area in May, June and September, 1972

FOOD ITEM	C&D CANAL		DELAWARE NORTH APPROACH		DELAWARE SOUTH APPROACH	
	No.[1]	Freq.[2]	No.[1]	Freq.[2]	No.[1]	Freq.[2]
Oligochaeta						
Fragments			14			
Polychaeta						
Scolecolepides viridis	1	1				
Insecta						
Larvae	5	5	64	11		
Copepoda	8	2				
Isopoda						
Chirodotea almyra	3	2	5	5	13	9
Cyathura polita	1	1	15	10	10	6
Amphipoda						
Gammarus daiberi	483	27	695	27	2099	69
Corophium lacustre	21	9				
Mysidacea						
Neomysis americana	12	7	28	6	1	1
Decapoda						
Crangon septemspinosa[3]			1	1	41	10
Palaemonetes vulgarus					3	3
Rithropanopeus harrisi	1	1				

Table X (continued.)

FOOD ITEM	C&D CANAL		DELAWARE NORTH APPROACH		DELAWARE SOUTH APPROACH	
	No.[1]	Freq.[2]	No.[1]	Freq.[2]	No.[1]	Freq.[2]
Osteichthyes						
Anchoa sp.					17	9
Fish eggs	219	6				
Fish remains					1	1
Unidentifiable remains		16		12		
Empty		30		6		4
Total number examined		87		61		90

---

1. Total number of organisms found.

2. Total number of stomachs containing that organism.

3. Only present in September.

Table XI. Stomach contents of striped bass, Morone saxatilis, caught in the C&D Canal area in May, 1972

FOOD ITEM	C&D CANAL		DELAWARE NORTH APPROACH	
	No.[1]	Freq.[2]	No.[1]	Freq.[2]
Nematomorpha	3	2		
Isopoda				
Chirodotea almyra			1	1
Amphipoda				
Gammarus daiberi	1	1	2	1
Osteichthyes				
Fish eggs	2	1		
Fish remains	7	6	1	1
Unidentifiable remains		31		
Empty		10		2
Total number examined		48		4

---

1. Total number of organisms found.

2. Total number of stomachs containing that organism.

Table XII. Stomach contents of channel catfish, Ictalurus punctatus, caught in the C&D Canal area in May and September, 1972

FOOD ITEM	C&D CANAL		DELAWARE NORTH APPROACH[3]	
	No.[1]	Freq.[2]	No.[1]	Freq.[2]
Nematoda	11	1		
Insecta	1	1		
Amphipoda				
Gammarus daiberi	245	2	2	1
Corophium lacustre	5	3		
Decapoda				
Crangon septemspinosa[3]	2	2	37	2
Rithropanopeus harrisi	2	2		
Osteichthyes				
Fish remains	9	9		
Empty				
Total number examined		16		2

---

1. Total number of organisms found.

2. Total number of stomachs containing that organism.

3. Only examined or found in September.

Table XIII. Stomach contents of weakfish, Cynoscion regalis, and spot, Leiostomus xanthurus, caught in the C&D Canal area in September, 1972.

FOOD ITEM	C&D CANAL				DELAWARE NORTH APPROACH				DELAWARE SOUTH APPROACH	
	Weakfish		Spot		Weakfish		Spot		Weakfish	
	No.[1]	Freq.[2]	No.[1]	Freq.[2]	No.[1]	Freq.[2]	No.[1]	Freq.[2]	No.[1]	Freq.[2]
Nematoda							1	1		
Copepoda			411	5			101	2		
Cirripeda										
Balanus sp.	5	2								
Amphipoda										
Gammarus daiberi	1	1	136	2	13	4	1	1	5	4
Corophium lacustre			1	1						
Mysidacea										
Neomysis americana	9	1	10	1	104	5			1	1
Decapoda										
Crangon septemspinosa			1	1	2	2			6	5
Osteichthyes										
Fish remains	6	5							1	1
Empty						1				1
Total number examined		10		5		7		3		8

1. Total number of organisms found.
2. Total number of stomachs containing that organism.

TABLE XIV TRAWL DATA March 5-9 1971

STATION #	109	110	111	112	113	114	115	116	
AIR TEMP. (°C)		5.0	1.0	4.5	8.3	6.0	1.0		
WATER TEMP. (°C)	3.1	4.3	4.1	4.2	4.9	4.5	4.0		
SALINITY (°/oo)	0.116	0.206	0.151	0.174	0.126	0.132	1.45		
OXYGEN (mg/L)	13.2	11.7	12.8	11.7	12.7	11.3	11.5		
pH	———	7.4	7.4	7.2	7.1	7.1	7.1		
SECCHI DISC (cm).	17	21	19	24	20	24	21		
DATE TIME (EST)	3/5/71 1600	3/8/71 1300	3/8/71 1500	3/5/71 1000	3/5/71 1315	3/5/71 1200	3/9/71 100		
TIME (Current, Knots)	East(2)	East	East	Ebb	Ebb	Ebb(2)	———		
LENGTH OF TRAWL (mi.)	1.0	1.0	1.0	0.9	0.5	1.0	1.0		
DEBRIS	log	———	hang	Torn Net	———	———	———		TOTAL NO. OF FISH
Anguillidae									
Anguilla rostrata (American eel)						1			1
Clupeidae									
Alosa pseudoharengus (Alewife)							15		15
Cyprinidae									
Notemigonus crysoleucas (Golden Shiner)				1					1
Minnow-unident.			1						1
Ictaluridae									
Ictalurus catus (White catfish)	1								1
Ictalurus nebulosus (Brown Bullhead)				1					1
Percichthyidae									
Morone americana (White Perch)	42	15	3	57	1	3	12		133
Morone saxatilis (Striped Bass)	2	1				1	1		5
Fish/station	45	16	4	59	1	5	28		158
Fish/station/0.1mi.	4.5	1.6	0.4	6.6	0.2	0.5	2.8		

TABLE XV — 74ANL DATA — April 7-8 1971

STATION #	109	110	111	112	113	114	115	*116	
AIR TEMP. (°C)		15	14.5	11.0	7.0	9.0	11.0	11.0	
WATER TEMP. (°C)	8.1	7.8	7.6	7.4	7.8	7.9	7.5	7.4	
SALINITY (°/oo)	0.269	0.202	1.052	3.292	0.386	0.299	1.824	1.251	
OXYGEN (mg/L)	12.72	10.69	10.52	10.73	9.82	9.69	10.48	10.73	
pH	6.96	6.90	7.00	7.30	7.58	6.9	6.9	7.2	
SECCHI DISC (cm).		20	23	26	23	23	18	25	
DATE TIME (EST)	4/8 1630	4/7 1600	4/7 1445	4/7 1230	4/8 1000	4/8 1200	4/8 1400	4/7 1100	
TIDE (Current, Knots)	East (2)	East(2)	East(3)	ebb(2)	Flood(1.5)	Flood (0.5)	ebb(3)	flood(1)	
LENGTH OF TRAWL (mi.)	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	
DEBRIS	———	18 rocks orn mat	———	tree 25'	1 veg. log cable rocks	rocks	20 ft. cable out rocks	———	TOTAL NO. OF FISH
Clupeidae									
Alosa aestivalis (Blueback Herring)	1	29	5	6	1	8	5	3	58
Alosa pseudoharengus (Alewife)	1	12	3	7	1	3	2		29
Alosa sapidissima (American shad)		1							1
Ictaluridae									
Ictalurus catus (White Catfish)								1	1
Ictalurus nebulosus (Brown Bullhead)					1	2		1	4
Percichthyidae									
Roccus americanus (White perch)	155	18	35	27	33	31	25	39	363
Morone Saxatilis (Striped Bass)	3						2	2	7
Percidae									
Perca flavescens (yellow Perch)		1							1
Triglidae									
Prionotus carolinus (Northern Sea robin)				1					1
Fish/station	160	61	43	41	36	44	34	46	465
Fish/station/0.1mi.	16.0	6.1	4.3	4.1	3.6	4.4	3.4	4.6	
Mysidopsis almyra	1		1	1			1	2	6

* 116 now off Getty Termina

TABLE XVI TRAWL DATA May 14 & 17 1971 -51-

STATION #	109	110	111	112	113	114	115	116	
AIR TEMP. (°C)	26	24	24.5	16.0	23.0	21.0	23.0	24.0	
WATER TEMP. (°C)	16.1	16.7	16.4	15.5	16.1	15.9	15.6	16.2	
SALINITY (°/oo)	1.520	0.239	0.353	1.000	0.174	0.344	1.205	0.424	
OXYGEN (mg/L)	7.17	one sample 12.08	9.58	6.58	3.40	5.37	6.36	4.81	
pH	———	———	7.3	6.8	———	6.7	6.7	6.7	
SECCHI DISC (cm).	23	32	28	28	51	———	29.0	51	
DATE	5/17	5/14	5/14	5/14	5/17	5/17	5/14	5/17	
TIME (EST)	1400	1400	1300	0900	1130	1100	1030	1200	
TIDE (Current, Knots)	3 East	0.5 West	0.5 East	Ebb	2 Ebb	3 Ebb	0.5 slack	1 Ebb	
LENGTH OF TRAWL (mi.)	1.0	1.0	1.0	0.7	1.0	1.0	1.0	1.0	
DEBRIS	———	———	Rock	Board	———	———	Lg. rocks	———	TOTAL NO. OF FISH
Anguillidae (American eel)									
Anguilla rostrata		1	1				1	3	6
Clupeidae									
Alosa aestivalas (blueback herring)				12(18)			3		15(21)
Alosa pseudoharengus (Alewife)		1		7(10)			1		9(12)
Alosa sapidissima (American shad)	9				2	36		5	52
Engraulidae									
Anchoa mitchilli (Bay Anchovy	9			3(4)			6		18(19
Cyprinidae									
Cyprinus carpio (carp)							1		1
Shiner					1				1
Ictaluridae									
Ictalurus catus (White catfish)	3		1					1	5
Ictalurus nebulosus (Brown Bullhead)	1	1			3		1	1	7
Ictaluris punctatus (Channel Catfish)	2	6	1						9
Percichthyidae									
Morone americanus (White Perch)	126	129	59	7(10)			63	20	374 (377)
Morone saxatilis (striped bass)	7	12			1		5		25
Soleidae									
Trinectes maculatus (Hog choker)	9	77	31				11	1	129
Fish/station	136	227	93	29(43)	7	36	92	31	661 (665)
Fish/station/10.1 mi	18.6	22.7	9.3	4.1	0.7	3.6	9.2	3.1	
Blue crab	1		1	1	6	1	1	3	14
Mud Crab						2			2

TABLE XVII TRAWL DATA June 1-7 1971 -52-

STATION #	(1) 109	110	111	112	113	(2) 114	115	116	
AIR TEMP. (°C)	29.0	31.5	28.0	28.0	26.5	19.0	37.0	22.0	
WATER TEMP. (°C)	21.5	21.3	19.1	19.1	19.1	19.1	18.6	18.5	
SALINITY (°/oo)	1.054	1.574	1.267	1.976	0.2135	0.224	3.726	1.673	
OXYGEN (mg/L)	12.01	9.40	7.22	5.37	4.24	4.38	7.07	6.35	
pH	7.2	6.9	6.9	6.7	6.6	6.7	——	6.9	
SECCHI DISC (cm).	63.0	60.0	40.0	35	60	60.0	——	34	
DATE TIME (EST)	6/7 1020	6/7 1215	6/4 1245	6/4 1015	6/3 1215	6/3 1530	6/4 0830	6/3 0830	
TIDE (Current, Knots)	0 slack	1 West	— West	1 ebb	— ebb	slack 0 late flood 1 early ebb		ebb 0.5	
LENGTH OF TRAWL (mi.)	0.5	0.5	1.0	1.0	0.9	1.0	1.0	1.0	
DEBRIS	torn chain torn net rock 100lb. 10ft		——	——	trees & rocks	rocks & mud	——	——	TOTAL NO. OF FISH
Anguillidae									
Anguilla rostrata (American Eel)	3(6)	4(8)	1	1	1	2	1	1	14
Clupeidae									
Alosa aestivalis (Blueback Herring)					1				1
Brevoortia tyrannus (Atlantic Menhaden)				2			3		5
Engraulidae									
Anchoa mitchilli (Bay anchovy)							1		1
Cyprinidae									
Cyprinus carpio (carp)									
Ictaluridae									
Ictalurus catus (white catfish)					1				1
Ictalurus Nebulosus (Brown bullhead)					1				1
Ictalurus Punctatus (Channel catfish)	3(6)	6(12)	3					1	13
Pereichthyidae									
Morone Americanus (White Perch)	123(246	217(434)	198	83	1	13	273	214	1122
Morone saxatalis (Striped bass)	5(10)	3(6)	12	9	3	3	27	30	92
Soleidae									
Trinectes maculatus (Hogchoker)	18(36)	12(24)	9	3	1		4	7	54
Fish/station	152(304)	242(484)	223	99	8	18	309	253	1304
Fish/station/0.1 mi.	30.4	48.4	22.3	9.9	0.9	1.8	30.9	25.3	
Crangon							sand shrimp		
Blue Crab	2♂	1♂	4(2♂+1♀)	7♂	3(6♂,1♀)	3(2♂,1♀)	31 (19♂,12♀)	23 (11♂,12♀)	79

(1) Moved ½ mi East for this month
(2) Moved to Del. side of Channel

TABLE XVIII TRAWL DATA July 1971

STATION #	109	110	111	112	113	114	115	116	
AIR TEMP. (°C)		35.5	37.0	29.1	35.5	34.4	30.4	31.5	
WATER TEMP. (°C)	27.0	26.6	26.6	26.4	26.2	26.4	26.0	26.1	
SALINITY (°/oo)	2.65	2.69	4.24	3.18	3.32	3.44	4.68	3.21	
OXYGEN (mg/L)	7.61	7.68	6.00	6.65	5.35	4.89	5.61	6.85	
pH	7.4			7.3	7.0	7.2	7.2	7.2	
SECCHI DISC (cm).	40	65.0	65.0		60.0	40.0	45	60	
DATE	7/9/71	7/8/71	7/8/71	7/7/71	7/7/71	7/8/71	7/8/71	7/7/71	
TIME (EST)	0800	1530	1400	0815	1130	1130	0915	0945	
TIDE (Current, Knots)	East 3k	East 1k	near slack	flood 2k	early ebb	flood 3k	early flood	early flood	
LENGTH OF TRAWL (mi.)	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	
DEBRIS	rough bottom mud in net	——	——	——	rough bottom	——	——	——	TOTAL NO. OF FISH
Acipenser oxyrhynchus (Atlantic Sturgeon)							1		1
Anguilla rostrata (American eel)		1				1	4		6
Clupeidae									
Alosa pseudoharengus (Alewife)					5		1	2	8
Brevoortia tyrannus (Atlantic Menhaden)	4		2	1					7
Cyprinidae									
Cyprinus carpio				1					1
Ictaluridae									
Ictalurus catus (White catfish)	1								1
Ictalurus nebulosus (Brown bullhead)		2		1				5	8
Ictalurus punctatus (Channel Catfish)	2	1	3	3		1	1		11
Percichthyidae									
Morone americana (White perch)	6	126	143	12	357	419	12	64	1139
Morone saxatilis (striped bass)	1	2	1	1	3			4	12
Pomatomus saltatrix (Bluefish)							1		1
Sciaenidae									
Cynoscion regalis (Weakfish)	54 juv	70juv	1048juv	113juv	324juv	986juv	352 juv 3 adult	362 juv	3309 juv 3 adult
Leiostomus xanthurus (Spot)	1juv		1juv			1juv	1	5juv	9
Atherinidae									
Menidia menidia				1	1		2		4
Soleidae									
Trinectes maculatus		2	2			1		1	6
Fish/station	69	204	1200	133	690	1409	578	443	4726
Fish/station/0.1mi.	6.9	20.4	190.0	13.3	69.0	140.9	57.8	44.3	
Blue Crab	7♂5♀	57♂+21♀	44♂,13♀	7♂, 3♀	36♂,20♀	19♂,12♀	8♂, 13♀	66♂, 32	244♂, 119♀

TABLE XIX TRAWL DATA August 1971 -54-

STATION #	109	110	111	112	113	114	115	116	
AIR TEMP. (°C)	30.0	30.0	29°C	25.0	28.0	25.0	22.0	30.0	
WATER TEMP. (°C)	26.8	27.0	27.0	27.4	27.1	27.0	26.4	27.1	
SALINITY (°/oo)	0.906	0.705	0.804	2.263	2.593	3.148	4.696	2.760	
OXYGEN (mg/L)	7.42	7.17	7.34	6.36	6.16	6.42	6.59	6.08	
pH	7.3		7.3	7.2	7.3	7.3		7.2	
SECCHI DISC (cm).	74		30.0	54.0	58	48	75	60.0	
DATE	8/3	8/3	8/3	8/4	8/4	8/4	8/5	8/4	
TIME (EST)	1200	1400	1500	1530	1030	0900	0900	1300	
TIDE (Current Knots)	east (1k)	east 3	east	ebb2-3k	flood/ ebb	flood	flood/ ebb	ebb	
LENGTH OF TRAWL (mi.)	0.9	0.9	0.75	0.9	1.0	1.0	1.0	1.0	
DEBRIS	hums	corn net net lotsch short on 2nd haul	corn net	corn net not hard bottom area	on---	rocks &gravel	heavy rock	---	TOTAL NO. OF FISH
Anguilla rostrata			1			2		4	7
Clupeidae									
Alosa pseudoharengus		1	1	3	9	3		2	19
Brevoortia tyrannus	10	5		10	1	2		6	34
Engraulidae									
Anchoa mitchilli			1	5			5	1	12
Ictaluridae									
Ictalurus catus								1	1
Ictalurus punctatus	25	5	1	1		1	1	4	38
Percichthyidae									
Morone americanus	225	122	9	2	196	103	3	27	687
Morone saxatilis			1	10	43	32	3	12	101
Sciaenidae									
Cynoscion regalis	8juv	9juv	17juv	57juv	1208juv	5030juv	472juv 5adult	509juv	7310 juv 5 adult
Leiostomus xanthurus				11	105	51	2	22	191
Pogonias cromis								1	1
Soleidae									
Trinectes maculatus	4	5	1			1	1		12
Fish/station	272	147	32	99	1562	5225	492	589	8418
Fish/station/0.1mi.	30.2	16.3	4.3	11.0	156.2	522.5	49.2	58.9	
Blue Crab	7♂,4♀	11♂,2♀	4♂,2♀(1m)	4♂,1♀(m)	11♂,4♀ (3m)♀	67♂,24♀ (1m)♀	13♂,12♀ (2m)♀	19♂ 5♀	260♂ 97♀ (10M)♀
Crangon			1						

TABLE XX TRAWL DATA September 1971

STATION #	109	110	111	(1) 112	113	114	115	116	
AIR TEMP. (°C)	26.0	24.5	24.3	28.6	25.5	25.0	25.1	20.4	
WATER TEMP. (°C)	25.9	25.2	25.7	24.9	24.2	24.0	24.6	25.1	
SALINITY (°/oo)	1.842	1.020	2.557	0.344	0.123	0.119	0.632	0.763	
OXYGEN (mg/L)	8.48	3.93	5.60	2.88	3.58	2.40	2.49	3.68	
pH	6.85	---	6.60	---	---	---	---	---	
SECCHI DISC (cm).	57	64cm	51	53	29	22	51.0	50.0	
DATE	9/13	9/16	9/13	9/15	9/14	9/14	9/15	9/14	
TIME (EST)	1100	0830	1330	1330	1300	1400	0930	0900	
TIME (Current, Knots)	late ebb flood(0-4)	east	east	ebb	ebb	ebb slack low	early ebb	early ebb	
LENGTH OF TRAWL (mi.)	0.9	1.0	1.0	0.5	1.0	1.0	1.0	1.0	7.4
DEBRIS	---	large clods	15 foot near end of drag	tornnet	Oil slick surface.	ton stones	---	---	TOTAL NO. OF FISH
Anguilla rostrata		6					5	4	15
Clupeidae									
Alosa pseudoharengus		3		4	1	1	229	21	259
Brevoortia tyrannus		6		13			13	16	48
Engraulidae									
Anchoa mitchilli	3	2	5				45		55
Ictaluridae									
Ictalurus punctatus	41	9	5					2	57
Ictalurus nebulosus	1	1						12	14
Poeciliidae									
Morone americanus	446	1057	32	6			341	211	2093
Morone saxatilis	1	4		3		1	3	11	23
Centrarchidae									
Lepomis macrochirus (Bluegill)						1			1
Pomatomus saltatrix		1	1					1	3
Sciaenidae									
Cynoscion regalis	161	125	296	2			414	1	999
Leiostomus xanthurus	21	529	4	5			424	415	1398
Pogonias cromis	1						1	3	5
Gobiosoma bosci			1						1
Trinectes maculatus	2	6	1					1	10
Fish/station	677	1749	345	33	1	3	1475	698	4981
Fish/station/0.1mi	75.2	174.9	34.5	6.6	0.1	0.3	147.5	69.8	
Blue Crab	15♂,1♀	17♂	5♂	5♂,1♀	3♂	15♂,8♀	19♂,8♀	42♂,11♀	121♂ 29♀
Crangon			present						
Palaemonetes			present						

(1) Heavy rains in past weeks, local flooding in upper River

TABLE XXI TRAWL DATA October 1971 -56-

STATION #	109	110 (1)	111	112	113	114	115	116	
AIR TEMP. (°C)	21.5	--	16.0	27.0	22.0	25.0	26.0	19.0	
WATER TEMP. (°C)	20.9		20.6	21.1	21.0	21.1	21.0	21.0	
SALINITY (°/oo)	2.80	2.71	3.48	2.56	2.70	2.78	4.84	1.28	
OXYGEN (mg/L)	5.89	5.97	5.83	5.38	5.36	5.67	6.01	4.69	
pH	7.2	7.4	7.2	7.1	7.1	7.1	--	6.9	
SECCHI DISC (cm).	30	55	20	35	AA	45.0	25.0	40.0	
DATE TIME (EST)	0800 10/6/71	0945 10/7/71	0800 10/7/71	0930 10/6/71	1230 10/5/71	1400 10/5/71	1100 10/6/71	0815 10/5/71	
TIDE (Current, Knots)	East 1	East 1	East 1-2	Flood 2	High Slack 1	Ebb 1	Flood 1	Flood 2	
LENGTH OF TRAWL (mi.)	1.0	0.5	1.0	1.0	1.0	1.0(?)	1.0	0.9	
DEBRIS	--	--	Torn net at end	--	--	2 logs in 1 drg	Lost Net	Mang	TOTAL NO. OF FISH
Anguilla rostrata	2	2	1		1	1		1	8
Clupeidae									
Alosa aestivalis (blueback)	3						1		4
Alosa pseudoharengus	42	18	6	3	2	3		70	144
Brevoortia tyrannus	2	1	12	17	35	2	6	59	134
Engraulidae									
Anchoa mitchilli	166	24	17	63	3	3	53	6	335
Ictaluridae									
Ictalurus catus	2							3	5
I. punctatus	6		12		1			1	20
I. nebulosus								2	3
Belonidae-needle fish									
Strongylura marina		1							1
Syngnathidae-pipefish									
Syngnathus fuscus							1		1
Percichthyidae									
Morone americanus	224	66	52	16	424	76	5	332	1196
Morone saxatilis		2		1	3	5		7	18
Pomatomus saltatrix									0
Sciaenidae									
Bairdiella chrysoura			1				1	1	3
Cynoscion regalis	207	98	80	65	415	221	114	26	1226
Leiostomus xanthurus		4	1	2	17	3	2	19	48
Micropogon undulatus					3	1		2	6
Trinectes maculatus	2		3	1	2	3	6	2	19
Fish/station	656	216	185	168	907	318	189	531	3170
fish/station/0.1mi	65.6	43.2	18.5	16.8	90.7	31.8	18.9	59.0	
Blue crab		3♂,1♀	1♂	1♂, 1♀	22♂, 6♀	9♂	3♂, 3♀	7♂2♀	46♂,13♀
(1) 110 moved 0.5 mi due to dredge									
Crangon sp. (most station)				present			present	present	

TABLE XXII TRAWL DATA November 1971 -57-

STATION #	109	110	111	112	113	114	115	116	
AIR TEMP. (°C)	7.0	7.0	8.0	7.0	7.5	10.0	7.0	5.0	
WATER TEMP. (°C)	10.5	11.3	12.0	12.7	13.9	14.0	12.7	12.9	
SALINITY (°/oo)	1.346	1.408	1.490	1.724	0.398	0.311	1.712	1.434	
OXYGEN (mg/L)	10.522	10.94	10.53	8.32	5.46	4.98	8.55	7.40	
pH	7.4	7.6	7.4	7.0	6.9	7.2	6.9	7.2	
SECCHI DISC (cm).	50	60	80	30	30	30.0	25	40.0	
DATE TIME (EST)	0830 11/12/71	0800 11/1/71	0900 11/11/71	1100 11/11/71	1130 11/10/71	1400 11/10/71	1130 11/11/71	0900 11/10/71	
TIDE (Current, Knots)	West 2	West 1	West 1	Ebb 2.0	Ebb 1	Flood 0-1	Ebb 2	Ebb	
LENGTH OF TRAWL (mi.)	1.0	1.0	0.95	1.0	1.0	1.0	1.0	1.0	
DEBRIS	Mud	Stumps	Bad Btm.	Clean	Anchor Lg. Rock	Rocks, etc			TOTAL NO. OF FISH
Anguilla rostrata		1	1	1	8	4	2	5	22
Clupeidae									
Alosa aestivalis				33	6	12	12	2	65
A. pseudoharengus	5	3	3	74	2	22	29	65	203
A. sapidissima						3		2	5
Dorosoma cepedianum	3	1							4
Brevoortia tyrannus	1			13			17	9	40
Engraulidae									
Anchoa mitchilli				117			7	8	132
Cyprinidae									
Cyprinus carpio									0
Hybognathus nuchalis (silvery minnow)					1				1
Ictaluridae									
Ictalurus catus								1	1
I. punctatus	4	3		5				2	14
I. nebulosus					2	1			3
Percichthyidae									
Morone americanus	25	53	22	204	90	35	84	65	578
Morone saxatilis				1	1			2	4
Sciaenidae									
Cynoscion regalis		juv 4	juv 9	juv 8	juv 1		juv 1	juv 9	32
Leiostomus xanthurus	1	2		35	2	2	4	1	47
Micropogon undulatus				juv 5		juv 1	juv 6	juv 27	39
Pogonias cromis		1							1
Gobiosoma bosci	1								1
Trinectes maculatus	8	1	8	1				1	19
Fish/station	68	69	43	497	113	80	162	199	1211
Fish/station/0.1 mi	4.8	6.9	4.5	49.7	11.3	8.0	16.2	19.9	
Crangon	no shrimp	~50	shrimp	~300				~120	

TABLE XXIII TRAWL DATA December 1971 -58-

STATION #	109	110	111	112	113	114	115	116	
AIR TEMP. (°C)	7.0	6.0	6.0	9.0	---	9.5	11.5	6.0	
WATER TEMP. (°C)	6.2	6.6	6.8	6.8	6.7	6.8	6.9	6.5	
SALINITY (°/oo)	0.649	0.552	0.539	0.767	0.290	0.281	0.836	0.476	
OXYGEN (mg/L)	10.52	8.76	8.49	8.03	8.17	7.63	8.14	9.25	
pH	7.2	6.9	7.1	7.0	7.1	6.9	---	---	
SECCHI DISC (cm).	40	30	30	30	30	25	25	---	
DATE	12/14	12/14	12/14	12/13	12/14	12/14	12/13	14/14	
TIME (EST)	1500	1415	1300	1100	0945	0930	1230	1130	
TIDE (Current, Knots)	east 1k	slack east0.5	west 1k	ebb 2k	flood 1.5k	flood 2k	ebb 2k	ebb 0.5-1.0	
LENGTH OF TRAWL (mi.)	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	
DEBRIS	mud in one drag	---	---	trees in both drags	stones corn nat	rocks in one drag	few stones	---	TOTAL NO. OF FISH
Petromyzon marinus (Sea Lamprey)				1					1
Anguilla rostrata						1		2	3
Clupeidae									
Alosa aestivalis (Blueback)						1			1
A. pseudoharengus					1				1
Ictaluridae									
I. punctatus		1				1			2
Percichthyidae									
Morone americanus	57	29	38	14	7	1	40	46	232
Sciaenidae									
Micropogon undulatus (Croaker)							2juv		2
Trinectes maculatus		1	2						3
Fish/station	57	31	40	15	8	4	42	48	245
Fish/station/0.1mi.	5.7	3.1	4.0	1.5	0.8	0.4	4.2	4.8	
Crangon septemspinosa								1	1
Rhithropanopeus harrisi			2				1	3	6

TABLE XXIV TRAWL DATA March 1972

STATION #	109	110	111	112	113	114	115	116	
AIR TEMP. (°C)		17.0	17.0	15.0	10.8	10.0	13.5	14.5	
WATER TEMP. (°C)		2.4	2.9	2.7	3.2	3.1	2.4	2.7	
SALINITY (°/oo)	0.159	0.281	0.449	0.735	0.495	0.556	4.859	0.987	
OXYGEN (mg/L)	11.76	11.65	10.29	10.54	8.66	7.59 muddy	10.81	10.62	
pH	---	---	---	---	---	---	---	---	
SECCHI DISC (cm).	45	40	30		25.0	30.0	40	35	
DATE	3/1	3/1	3/1	2/29	2/29	2/28	2/29	2/29	
TIME (EST)	1200	1015	0900	1500	1015	0915	1330	1200	
TIDE (Current, Knots)	0.5W	1.5e	1.5e	1.5 ebb	flood 1.0	flood 1k	ebb 0.5-1.0	flood 0.5-1.0	
LENGTH OF TRAWL (mi.)	1.0	1.0	1.0	1.0	0.5	1.0	1.0	1.0	
DEBRIS	clean	clean	clean	clean		rocks	hole in net	hole in net	TOTAL NO. OF FISH
Anguilla rostrata elvers			2		3		several	1	9
Cyprinidae Shiner	1								1
Ictalurus punctatus		1							1
Percichthyidae									
Morone americanus	3		2	4	2	1	12	12	36
Morone saxatilis	1						1		2
Percidae									
Perca flavescens		1				1			2
Fish/station									43
Fish/station/0.1mi.	0.5	0.2	0.4	0.4	1.0	0.2	1.6	1.4	9elvers

TABLE XXV TRAWL DATA April 4-5 1972 -60-

STATION #	109	110	111	112	113	114	115	116	
AIR TEMP. (°C)	---	11.5	8.5	6.0	10.0	9.5	7.0	9.0	
WATER TEMP. (°C)	---	7.4	7.1	7.3	7.6	7.6	7.4	7.5	
SALINITY (°/oo)	0.326	0.493	0.546						
OXYGEN (mg/L)	9.982	9.479	8.961	8.820	7.594	7.586	8.679	8.969	
pH	---	---	---	---	---	---	---	---	
SECCHI DISC (cm).	50	40	---	30	35	40	30	35	
DATE	4/5	4/5	4/5	4/4		4/4	4/4	4/4	
TIME (EST)	1345	1200	1000	1030	1345	1115	0900	1445	
TIDE (Current, Knots)	1.0-1.5 East	2.0k East	1.5k East	slack	2k flood	1-1.5 flood	1.5k ebb	1.5 flood	
LENGTH OF TRAWL (mi.)	1.0	1.0	1.0	1.0	1.0	0.5	1.0	1.0	
DEBRIS	clean		torn net		few stones	stones	---	---	TOTAL NO. OF FISH
Anguilla rostrata			1		1			2	4
Clupeidae									
Alosa aestivalis			1	2	2		2	3	10
A. pseudoharengus		2	3	1			6	4	16
A. sapidissima								1	1
Engraulidae									
Anchoa hepsetus									
Cyprinus carpio			1						1
Percichthyidae									
Morone americana	39	88	90	39	7	3	34	78	378
Morone saxatilis	1	1	3	1				7	13
Fish/station	40	19	99	43	10	3	42	96	424
Fish/station/0.1mi.	4.0	9.1	9.9	4.3	1.0	0.6	4.2	9.6	

TABLE XXVI TRAWL DATA May 8 & 10 1972 -61-

STATION #	109	110	111	112	113	114	115	116	
AIR TEMP. (°C)	21.0	---	26.0	12.5	19.0	15.0	10.5	16.0	
WATER TEMP. (°C)	16.8	16.4	16.2	15.1	15.3	15.4	15.0	15.3	
SALINITY (°/oo)	0.163	0.352	0.337	0.210	0.125	0.275	2.164	0.125	
OXYGEN (mg/L)	9.278	9.411	8.366	8.030	6.374	7.251	7.388	5.600	
pH	---	---	---	---	---	---	---	---	
SECCHI DISC (cm).	30.0	45.0	---	---	50	50	---	50	
DATE	5/8	5/8	5/8	5/10	5/10	5/10	5/10	5/10	
TIME (EST)	1244	1033	0941	0930	1230	1045	0215	1400	
TIDE (Current, Knots)	east 1k	east 1k	west 1k	ebb 0.5k	ebb 1.5k	ebb 1k	flood 0.5k	ebb 1.5k	
LENGTH OF TRAWL (mi.)	0.75	0.5	1.0	1.0	0.75	1.0	1.0	1.0	
DEBRIS	10ft log mud			piece of pier	tree ripped net		log	clean	TOTAL NO. OF FISH
Anguilla rostrata		5	5		1	2	7		20
Clupeidae									
Alosa aestivalis						2	1		3
Alosa pseudoharengus	2	1	6	1	2	2	3	1	18
Engraulidae									
Anchoa mitchill				72	1	9	49		131
Cyprinus carpio								1	1
Shiner					3	1			4
Ictaluridae									
I. catus					1	1		1	3
I. nebulosus	1			3	1			4	9
I. punctatus	14	7	4						20
Percichthyidae									
Morone americanus	148	48	43	22	36	18	139	266	720
Morone saxatilis	280	25	9	9	4		18		345
Percidae									
Perca flavescens								1	1
Soleidae									
Trinectes maculatus	13	52	5						70
Fish/station	458	138	72	107	49	35	217	274	1349
Fish/station/0.1 mi.	61.06	27.60	7.20	10.70	6.53	3.50	21.70	27.4	

TABLE XXVII TRAWL DATA May 31-June 1 (June 1972)

STATION #	109	110	111	112	113	114	115	116	
AIR TEMP. (°C)	17.0	21.5	———	20.5	23.5	22.5	17.0	26.5	
WATER TEMP. (°C)	20.6	19.5	19.1	18.9	19.6	19.3	19.1	19.3	
SALINITY (°/oo)	1.678	1.458	1.892	1.716	0.310	0.385	1.196	1.171	
OXYGEN (mg/L)	7.857	7.051	6.936	7.003	5.675	5.710	6.919	6.742	
pH	———	———	———	———	———	———	———	———	
SECCHI DISC (cm).	30	50	45	30	25		35	40.0	
DATE TIME (EST)	6/1/72 1000	6/1/72 0845	6/1/72 0738	5/31/72 0900	5/31/72 1230	5/31/72 1030	5/31/72 0800	5/31/72 1345	
TIDE (Current, Knots)	East 2k	East 15k	East 1k	Flood0.5	1.5-20 Flood	Flood 1.0	Ebb 1.5	Flood 1.0	
LENGTH OF TRAWL (mi.)	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	
DEBRIS	strong tide clean	clean	clean	clean	clean	mill stone	log	clean	TOTAL NO. OF FISH
Anguilla rostrata			2			1+elver	3	5	11+ elver
Clupeidae									
Alosa aestivales				1	2				3
A. pseudoharengus			1	2	1				4
Engraulidae									
Anchoa mitchilli			1					1	2
Ictaluridae									
I. catus		1				1			2
I. nebulosus		1	5		2	1		1	10
I. punctatus		6	5		1				12
Percichthyidae									
Morone americanus	57	89	410	77	100	260	105	195	1293
Morone saxatilis	1	4	6	1	3		1	6	22
Perca flavescens		1							1
Soleidae									
Trinectes maculatus	7	31	1	1				2	42
Fish/station	65	133	431	82	109	263	109	210	1402
Fish/station/0.1mi	6.5	13.3	43.1	8.2	10.9	26.3	10.9	21.0	

TABLE XXVIII TRAWL DATA July 1972 -63-

STATION #	109	110	111	112	113	114	115	116	
AIR TEMP. (°C)	27.0	29.0	26.0	30.0	28.0	33.0	25.0	31.0	
WATER TEMP. (°C)	22.9	22.0	22.9	22.3	22.40	22.40		23.00	
SALINITY (°/oo)	0.102	0.104	0.1405	0.136	0.1305	0.1165	0.181	0.134	
OXYGEN (mg/L)	5.38	5.95	4.18	4.45	4.032	3.539	4.29	4.96	
pH	———	———	———	———	———	———	———	———	
SECCHI DISC (cm).	20	20	23	31.0	26.0	41	30	25	
DATE TIME (EST)	7/10/72 0930	7/10/72 1200	7/12/72 0800	7/10/72 1400	7/11/72 1100	7/11/72 0915	7/11/72 1530	7/11/72 1400	
TIDE (Current, Knots)									
LENGTH OF TRAWL (mi.)	1.0	0.9	1.0	1.0	1.0	0	1.0	1.0	
DEBRIS	———	———	———	———	mud, log	torn net	hung		TOTAL NO. OF FISH
Anguillidae									
Anguilla rostrata							1	2	3
Clupeidae									
Brevoortia tyrannus	1		2						3
Ictaluridae									
Ictalurus catus	2	1							3
Ictalurus nebulosus	1	10	1		1		1	2	16
Ictalurus punctatus		3	2	1					6
Cyprinidae									
Cyprinus carpio		1							1
Percichthyidae									
Morone americana	54	85	13	56	19		21	220	468
Morone saxatilis			1	1			1	2	5
Sciaenidae									
Leiostomus xanthurus			1				1		2
Soleidae									
Trinectes maculatus	4								4
Fish/Station	62	100	20	58	20		25	226	511
Fish/Station/0.1 Mi.	6.2	11.9	2.0	5.8	2.0		2.5	22.6	

Similar to 112

Very few blue crabs.

TABLE XXIX TRAWL DATA August 1972 -64-

STATION #	109	110	111	112	113	114	115	116	
AIR TEMP. (°C)	23.0	26.0	23.0	23.0	30.0	32.5	23.0	30.0	
WATER TEMP. (°C)	25.1	25.1	25.0	24.8	25.6	25.4	24.7	25.6	
SALINITY (°/oo)	1.755	2.394	3.354	5.434(1)	2.966	3.463	6.309	2.796	
OXYGEN (mg/L)	6.79	6.70	6.69	6.68	6.54	6.52	7.04	6.98	
pH	7.0	7.0	——	6.9	——	7.0	——	7.0	
SECCHI DISC (cm).	35	50	50	55	40	30	55	30	
DATE TIME (EST)	8/10/72 0730	8/10/72 0830	8/10/72 1015	8/10/72 1415	8/9/72 1330	8/9/72 1200	8/10/72 1200	8/9/72 1630	
TIDE (Current, Knots)	E 2.0	East 2.0	High slack	early ebb 0.5-1.0	Ebb 1.5 -0	late flood 0.5	flood 1.5	Ebb 1.5	
LENGTH OF TRAWL (mi.)	1.0	1.0	0.5	0.5	1.0	1.0	1.0	1.0	
DEBRIS	——	——	——	mud.	——	——	clear	clear	TOTAL NO. OF FISH
Anguillidae									
Anguilla rostrata					2	6			8
Clupeidae									
Alosa aestivalis		1							1
Alosa pseudoharengus	1	6	14			2			23
Brevoortia tyrannus	3	11		4		2		19	39
Engraulidae									
Anchoa mitchilli	1	1		1	1	1			5
Cyprinidae									
Cyprinus carpio								1	1
Ictaluridae									
Ictalurus catus		1			1				2
Ictalurus nebulosus		10	3					3	16
Ictalurus punctatus		2	3					1	6
Percichthyidae									
Roccus americana	130	62	48	4	553	232	3	308	1340
Morone saxatilis	2					2		4	8
Sciaenidae									
Sciaenidae									
Cynoscion regalis	24 juv.	53 juv. 1(im)	112 juv.	236 juv. 5 ad.	286 juv. 1 ad.	1314 juv.	119 juv.	41	2185 juv. 1(im)
Leiostomus xanthurus	2	8	3	5	4	14	5	22	63
Micropogon undulatus	2	1	4	2	1	3		8	23
Soleidae									
Trinectes maculatus			2						2
Fish/Station	165	157	189	257	849	1578	127	407	3729
Fish/Station/o.1 Mi.	16.5	15.7	33.8		84.9	157.8	12.7	40.7	
Crab	1♂--	5♂2♀	3♂--	2♂4♀(2 im)	6♂3(1 im)	14♂(13 im) 1♀	9♂(4 im)	5♂---	32♂ (22 im) 35♀ (2 im)

TABLE XXX TRAWL DATA September 1972 -65-

STATION #	109	110	(1) 111	112	113	114	115	116	
AIR TEMP. (°C)	29.0	——	30.0	26.0	——	25.0	28.0	21.0	
WATER TEMP. (°C)	24.00	23.80	23.90	24.00	23.90	23.90	23.70	23.90	
SALINITY (°/oo)	5.595	5.716	5.888	4.645	4.471	5.322	8.105	4.598	
OXYGEN (mg/L)	6.324	6.768	6.085	5.865	6.815	6.538	7.292	6.419	
pH	——	——	——	——	——	——	——	——	
SECCHI DISC (cm).	80	70	56	60	39.0	50	50	50	
DATE TIME (EST)	9/7/72 1200	9/7/72 1015	9/7/72 1900	9/7/72 0800	9/6/72 1000	9/6/72 1215	9/6/72 1400	9/6/72 0830	
TIDE (Current, Knots)	2.0k West	Near slack West	0.25-E	1.5 flood	1.5-2.0 flood	0.5 ebb	1.5 ebb	2.0 flood	
LENGTH OF TRAWL (mi.)	0.8	1.0	1.0	1.0	1.0	1.0	1.0	1.0	
DEBRIS	hung up		move 0.3 m.w.dredge	clean	clean	clean	clean	clean	TOTAL NO. OF FISH
Anguillidae									
Anguilla rostrata	1								1
Clupeidae									
Alosa aestivales	1		2					17	20
Alosa pseudoharengus	1		4		2			3	10
Brevoortia tyrannus		2	4	1	3		1	2	13
Engraulidae									
Anchoa mitchilli	7	11	13					1	32
Ictaluridae									
Ictalurus nebulosus				1	1				2
Ictalurus punctatus	4	4	4	1	2	2		4	21
Percichthyidae									
Morone americana	11	4	21	3	22	6	14	29	110
Morone saxatilis				1	1	2		2	6
Pomatomidae									
Pomatomus saltatrix								1	1
Sciaenidae									
Cynoscion regalis	48	464	318	86	413	857	221	1005	3412
Leiostomus xanthurus	6	16	8	7	5	4		18	64
Micropogon undulatus			2	9		9	4	35	59
Bairdiella chrysura			1		1	1			3
Soleidae									
Trinectes maculatus	7		3					1	11
Fish/Station	85	501	380	110	450	881	240	1118	3765
Fish/Station/0.1 Mi.	10.6	50.1	38.0	11.0	45.0	88.1	24.0	111.8	
Blue Crab	4 [illegible]	3 [illegible]	[illegible] 1 m.	3 [illegible] 1 m.	[illegible]	15 [illegible] 9 m	6 [illegible] 5 m	3 [illegible] 3 m.	41 [illegible] 19m)

(1) Station 111 move 0.3 mi W for dredge.

TABLE XXXI TRAWL DATA October 1972 -66-

STATION #	109	110	111	112	113	114	115	116	
AIR TEMP. (°C)	25.0	18.0	22.0	21.5	23.0	23.0	21.0	24.0	
WATER TEMP. (°C)	19.6	19.5	19.3	19.2	19.6	19.7	19.4	19.4	
SALINITY (°/oo)	7.72	7.70	8.74	8.70	6.73	6.76	8.78	7.69	
OXYGEN (mg/L)	7.58	7.99	8.20	8.09	7.57	7.82	7.78	8.03	
pH	--	--	--	--	--	--	--	--	
SECCHI DISC (cm).	80	60	60	60	70	70	75	60	
DATE TIME (EST)	1300 10/4/72	1015 10/4/72	1330 10/4/72	1200 10/4/72	1000 10/3/72	1100 10/3/72	1230 10/3/72	1030 10/3/72	
TIDE (Current, Knots)	East 1.0	West 2.0	West 0.5	Ebb 2.0	Ebb 0.5	Ebb 1.0	Ebb 1.0	Slack High	
LENGTH OF TRAWL (mi.)	1.0	1.0	1.0	1.0	1.0	1.0	0.5	1.0	
DEBRIS	Clear	Clear	Clear	Clear	Clear	Clear	Lg.Anchor		TOTAL NO. OF FISH
Clupeidae									
Alosa pseudoharengus		1			1	2	1		5
Brevoortia tyrannus		1	1		2			1	5
Engraulidae									
Anchoa mitchilli	1	5	5	1				3	15
Ictaluridae									
Ictalurus nebulosus	1								1
Ictalurus punctatus	38	20	2		2	2		3	67
Ictalurus catus	3	2							5
Anguillidae									
Anguilla rostrata	1	1		3		2		1	8
Percichthyidae									
Morone americana	118	24	6	6	23	14	20	14	225
Morone saxatilis					1			1	2
Sciaenidae									
Cynoscion regalis	115	421	71	390	41	231	126	976	2371
Leiostomus xanthurus	2		1		1			3	7
Micropogon undulatus		1							1
Bairdiella chrysoura		1		6				5	12
Soleidae									
Trinectes maculatus	5	10		2			1	3	21
Total Fish	283	488	86	408	71	251	143	1010	2745
Fish/Station/0.1 mi.	28.3	48.8	8.6	40.8	7.1	25.1	29.6	101.0	
Blue crab	1♀		1♂	4♀,2♂ (1m.)	5♀,2♂ (1m.)	2♀,3♂ (1m.)	5♀,3♂ (1m.)	1♀,2♂ (1m.)	30

TABLE XXXII TRAWL DATA November 1972

STATION #	109	110	111	112	113	114	115	116	
AIR TEMP. (°C)	18.0	16.0	13.0	9.0	6.5	8.5	8.0	6.0	
WATER TEMP. (°C)	12.5	12.4	12.3	12.4	12.4	12.5	12.3	12.3	
SALINITY (°/oo)	7.338	7.363	7.423	5.859	5.690	6.000	7.325	6.739	
OXYGEN (mg/L)	8.639	8.571	8.526	8.385	7.980	7.675	8.726	8.721	
pH	--	--	--	--	--	--	--	--	
SECCHI DISC (cm).	--	40	--	30	--	--	35	50	
DATE TIME (EST)	1200 11/2/72	1030 11/2/72	0930 11/2/72	1430 11/1/72	1030 11/1/72	1130 11/1/72	1330 11/1/72	0915 11/1/72	
TIDE (Current, Knots)	West 2.0	1.5 West 1.5 East	West 1.0	Ebb 1-1.5	Ebb 0.5-1.0	Ebb 1.0	Ebb 1.5	Last Fld.Slk.	
LENGTH OF TRAWL (mi.)	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	
DEBRIS	--	--	--	--	--	--	--	--	TOTAL NO. OF FISH
Anguilla rostrata					1	1			2
Clupeidae									
Alosa aestivalis	3	1	1	5			1		11
A. pseudoharengus	17	7	5	9	12	4	18	11	83
Brevoortia tyrannus	3	1	1						5
Engraulidae									
Anchoa mitchilli	5	5	6	2			26	17	61
Ictaluridae									
I. nebulosus					1				1
Percichthyidae									
Morone americanus	12	8	8	27	66	16	13	22	172
Morone saxatilis	1				2		1	1	5
Sciaenidae									
Cynoscion regalis	3 juv			1 juv	1 juv		4 juv	8 juv	17 juv
Leiostomus xanthurus	2	1		2	15	2		9	31
Micropogon undulatus		1					1	1	3
Bairdiella chrysoura					1			1	2
Soleidae									
Trinectes maculatus	1							1	2
Fish/station	47	24	21	46	99	23	63	72	395
Fish/station/0.1mi	4.7	2.4	2.1	4.6	9.9	2.3	6.3	7.2	
Crangon septemspinosa		few		crangon	crangon		crangon	crangon	

TABLE XXXIII TRAWL DATA December 1972 -68-

STATION #	109	110	111	112	113	114	115	116	
AIR TEMP. (°C)	3.5	4.0	17	12.0	8.0	4.0	10	8.0	
WATER TEMP. (°C)	6.1	6.1	6.4	6.3	6.3	6.0	6.2	6.0	
SALINITY (°/oo)	0.425	0.425	1.042	1.995	0.1305	0.1265	---	0.339	
OXYGEN (mg/L)	12.957	12.935	11.639	13.380	14.861	11.256	15.650	13.435	
pH	---	---	---	---	---	---	---	---	
SECCHI DISC (cm).	25	23	25	30	60	34	22	24	
DATE TIME (EST)	12/7/72 1500	12/7/72 1400	12/6/72 1500	12/6/72 1300	12/7/72 1030	12/7/72 0900	12/6/72 0930	12/7/72 1215	
TIDE (Current, Knots)	2.5k West	2.5 West	West 0.5	ebb 0.5	flood 1.5-1.0	flood 1.5	flood 2.0-2.5	flood	
LENGTH OF TRAWL (mi.)	0.5	1.0	1.0	0.5	1.0	0.5	1.0	1.0	
DEBRIS		3-3	3-0		0-1	1-	0-1	6-0	TOTAL NO. OF FISH
Anguillidae									
Anguilla rostrata						1			1
Clupeidae									
Alosa pseudoharengus	no fish			no fish				1	1
Ictaluridae									
Ictalurus punctatus					1				1
I. nebulosus						1			1
Perciehthyidae									
Morone americana		6	3					4	13
Morone saxatilis							1		1
Fish/station	0	6	3	0	1	1	1	6	18
Fish/station/0.1 mi	0	0.6	0.3	0	0.1	0.2	0.1	0.6	

TABLE XXXIV TRAWL DATA March 1973

STATION #	109	110	111	112	113	114	115	116	
AIR TEMP. (°C)	9°	9°	11	16°	15	19	16	16	
WATER TEMP. (°C)	4.9	4.7	4.7	5.7	1.1	5.7	5.5	5.2	
SALINITY (°/oo)	4.689	4.759	4.887	2.192	2.954	2.355	2.516	3.511	
OXYGEN (mg/L)	---	no	O_2	data	---	---	---	---	
pH									
SECCHI DISC (cm).	50	40	35	40	40	35	40	45	
DATE	3/9/73	3/8/73	3/8/73	3/8/73	3/9/73	3/9/73	3/9/73	3/8/73	
TIME (EST)	0800	0830	11:00	11:40	11:20	1345	10:25	1256	
TIDE (Current, Knots)	.5 flood	flood	.03 flood	1 flood	.5 flood	.2 flood	.2 ebb	.5 flood	
LENGTH OF TRAWL (mi.)	0.5	1	1	1	1	1	0.5	1	
DEBRIS	torn belly torn legs1,2			torn chain net ripped	1st dr. 2nd dr.	2/2001b tacks chafed bag	no fish torn net 1st dr.		TOTAL NO. OF FISH
Anguillidae									
Anguilla rostrata				1				7	8
Clupeidae									
Alosa aestivalis	1								1
Alosa mediocris					1				1
Percichthyidae									
Morone americanus	6	45	15	31	9	11	13	50	180
Morone saxatilis		1	1		1				3
Fish/station	7	46	16	32	11	11	13	57	193
Fish/station/0.1 mi	1.4	4.6	1.6	3.2	1.1	1.1	2.6	5.7	

TABLE XXXV TRAWL DATA April 1973 -70-

STATION #	109	110	111	112	113	114	115	116	
AIR TEMP. (°C)	10	11	8	10	9	---	12	10	
WATER TEMP. (°C)	9.6	9.6	9.5	10.2	10.5	10.1	10.3	10.2	
SALINITY (°/oo)	1.732	2.056	1.437	1.402	.1275	.597	1.002	.135	
OXYGEN (mg/L)	11.549	11.177	13.284	10.794	8.637	9.356	10.352	11.307	
pH									
SECCHI DISC (cm).	45	40	25	40	50	45	40	45	
DATE TIME (EST)	4/5 1:50	4/5 14:45	8:33	1041	1103	1245	0848	0920	
TIDE (Current, Knots)	flood 1	flood 1	flood 2.5	flood 2	flood 2.5	flood 1	flood 2	flood 2.5	
LENGTH OF TRAWL (mi.)	1	1	1	.5	.5		1	1	
DEBRIS				winch broke	rocks slag net tripped	300lb cobbles			TOTAL NO. OF FISH
Anguillidae									
Anguilla rostrata	1	1							2
Clupeidae									
Alosa pseudoharengus	3	4	7	3		1	3		21
A. aestivalis		1	2	3				1	7
A. sapidissima							1		1
Brevoortia tyrannus	1		1						2
Dorosoma cepedianum			1						1
Cyprinidae									
Notropus cornutus								1	1
Ictaluridae									
Ictalurus nebulosus				4		1		1	6
Percichthyidae									
Morone americana	45	35	48	5	1	13	14	5	216
Morone saxitalis	5	6	2	1	3	1	1	2	20
Fish/station	55	96	61	16	4	16	19	10	217
Fish/station/.1mi	5.5	9.6	6.1	3.2	.8	1.6	1.9	1.0	

TABLE XXXVI TRAWL DATA May 1973 -71-

STATION #	109	110	111	112	113	114	115	116	
AIR TEMP. (°C)	13	13	16	17	14	22	22	13	
WATER TEMP. (°C)	15.1	15	15.15	15.1	15.8	15.0	15.2	15.4	
SALINITY (°/oo)	.974	.620	.780	.550	.252	.233	.572	.325	
OXYGEN (mg/L)	7.620	9.049	8.350	7.620	5.427	7.676	10.26	6.851	
pH									
SECCHI DISC (cm).	35	35	55	25	25	70	55	40	
DATE TIME (EST)	13:00 5/8/73	13:15 5/4/73	11:40 5/4/73	13:10 5/7/72	09:25 5/8/73	11:38 5/7/73	08:05 5/4/73	5/8/73	
TIDE (Current, Knots)	Flood 2	Ebb 2	East 1.5	Flood 1.5	Ebb 2.5	Flood 1.0	East Ebb	Ebb 1.0	
LENGTH OF TRAWL (mi.)	1	1	.9	1	1	1	1	1	
DEBRIS	None		Sheet Metal, Tuffock						TOTAL NO. OF FISH
Acipenser oxyrhynchus							1		1
Clupeidae									
Alosa aestivalea	8			7	3	1	1		20
Alosa pseudoharengus	3	3	1	3	3	2	3	1	19
Brevoortia tyrannus	2								2
Anguillidae									
Anguilla rostrata	1				1				2
Engraulidae									
Anchoa mitchilli	1			2					3
Ictaluridae									
Ictalurus nebulosus		3	1	2	1	1	1	1	110
Ictalurus punctatus						2			2
Ictalurus catus								1	1
Percichthyidae									
Morone americana	251	49	54	13	12	12	32	148	571
Morone saxatilis	2	29	5	2	3		1	1	43
Percidae									
Perca flavescens							1		1
Soleidae									
Trinectes maculatus	1		4					1	6
Cyprinidae									
Notropus cornutus		1						1	1
Fish/Station	269	85	65	29	23	18	40	153	682
Fish/Station/0.1mi	26.9	8.5	7.2	2.9	2.3	1.8	4.0	15.3	

TABLE XXXVII TRAWL DATA June 1973 -72-

STATION #	109	110	111	112	113	114	115	116	
AIR TEMP. (°C)	30	29	33	27.0	31	32	23	28	
WATER TEMP. (°C)	27.2	27.0	26.4	24.9	24.7	24.8	24.8	24.8	
SALINITY (°/oo)	.154	.159	.174	.446	.184	.166	.648	.220	
OXYGEN (mg/L)	10.02	9.673	8.808	7.736	6.066	5.860	6.70	6.967	
pH									
SECCHI DISC (cm).	65	65	50	60	75	---	60		
DATE TIME (EST)	14:00 6/13	13:00 6/15	14:30 6/12/73	10:30 6/13/73	09:30-12:30 6/12	13:00 6/12	09:00 6/13	08:00 6/12	
TIME (Current, Knots)	Slack Low	W(1k)	E (2k)	(If) Flood 2 tons	Flood 1/2 Ebb 3/4	Ebb(1km)	Flood 2(km)	Flood	
LENGTH OF TRAWL (mi.)	1.0	1.0	.9	.5	1.0	1.0	1.0	1.0	
DEBRIS	---	---	End drag 6/13-12:55 12 lengths of trawl .5 2 tons	Trees roots	Hole in wing	Stones net torn	---	---	TOTAL NO. OF FISH
Clupeidae									
Alosa aestivales		3	2	1		1		1	8
Alosa pseudoharengus					1		1		2
Brevoortia tyrannus		1	2	1					4
Ictaluridae									
Ictalurus catus	1	2	1					1	5
Ictalurus nebulosus	2	2	1				7	1	13
Ictalurus punctatus	1	9							10
Anguilla rostrata		2				2	6	5	15
Percichthyidae									
Morone americana	17	97	115	315	47	25	760	745	2121
Morone saxatilis		1	2	1	1			14	19
Sciaenidae									
Micropogon undulatus				1			7	2	10
Soleidae									
Trinectes maculatus	1	4	1		1		1	1	9
Fish/Station	22	121	124	319	50	28	782	770	2206
Fish/Station/0.1 mi.	8.2	12.1	13.8	63.8	5.0	2.8	78.2	77.0	

TABLE XXXVIII TRAWL DATA July 1973

STATION #	109	110	111	112	113	114	115	116	
AIR TEMP. (°C)	26.5	25.5	33.0	---	---	---	---	---	
WATER TEMP. (°C)	28	23.80	27.4	---	26.0	26.10	26.40	26.5	
SALINITY (°/oo)	.383	.378	.282	---	.145	.259	.385	.207	
OXYGEN (mg/L)	3.913*	5.138	2.488	---	3.228	2.819	3.951	3.550	
pH									
SECCHI DISC (cm).	30	30	28	---	20	30	25	30	
DATE TIME (EST)	07:54 7/11/73	09:02 7/11/73	13:45 5/7/73	--- ---	09:28 7/10/73	10:21 7/10/73	11:55 7/10/73	08:12 7/10/73	
TIDE (Current, Knots)	Flood (2)	Ebb (.2)	Flood (2.5)	--- ---	Ebb (.3)	Ebb (1)	Ebb (2)	Flood (.3)	
LENGTH OF TRAWL (mi.)	1	1	1	---	1	1	1	1	
DEBRIS							Dead Striped Cunk eel		TOTAL NO. OF FISH
Clupeidae									
Alosa pseudoharengus		1							1
Alosa aestivalos			1						1
Ictaluridae									
Ictalurus catus	1	11	2						14
Ictalurus punctatus		10	1						11
Ictalurus nebulosus	1	1							2
Anguilla rostrata		1	1						2
Anchoa mitchilli	1								1
Percichthyidae									
Morone americana	27	148	54			1	1	7	238
Morone saxatilis			1						1
Sciaenidae									
Leiostomus xanthurus	6	50	22		6	1	1	13	99
Trinectes maculatus		1							
Fish/Station	36	223	82		6	2	2	20	371
Fish/Station/0.1 mi.	3.6	22.3	8.2		0.6	0.2	0.2	2.0	

Not Sampled

* Bad repeatability

TABLE XXXIX TRAWL DATA August 1973 -74-

STATION #	109	110	111	112	113	114	115	116	
AIR TEMP. (°C)									
WATER TEMP. (°C)	27.8	27.8			27.90	28.0	27.0	27.4	
SALINITY (°/oo)	0.473	0.575	1.093		0.477	0.419	2.245	1.426	
OXYGEN (mg/L)									
pH									
SECCHI DISC (cm).	50	55			40	40	50	65	
DATE	8/8/73	8/8/73	8/8/73		8/7/73	8/7/73	8/8/73	8/7/73	
TIME (EST)	07:30	09:00	10:00		11:30	14:05	12:00	10:00	
TIDE (Current, Knots)	West (0.2)	West (0.2)	West (0.2)		Ebb (2k)	Ebb (1.0)	Ebb (2.0)	Ebb (1.5)	
LENGTH OF TRAWL (mi.)	1.0	1.0	1.0		1.0	1.0	1.0	1.0	
DEBRIS									TOTAL NO. OF FISH
Clupeidae									
Alosa aestivalen					1				1
Alosa pseudoharengus	1	5	2			2			10
Brevoortia tyrannus							3	9	12
Engraulidae									
Anchoa mitchilli	2	6					1	2	11
Cyprinidae									
Cyprinus carpio								1	1
Ictaluridae									
Ictalurus catus			1		1	1		1	4
I. nebulosus		1	1		2		5	18	27
I. punctatus	1	1	5		3	3		2	15
Anguilla rostrata						3	1	1	5
Percichthyidae									
Morone americana	7	18	10	Not Sampled	55	90	38	163	581
Morone saxatilis					2		3	1	6
Sciaenidae									
Cynoscion regalis		9	28				657	74	768
Leiostomus xanthurus	3	39	116		816	409	183	544	2110
Micropogon undulatus								1	1
Soleidae									
Trinectes maculatus			1		1		1	3	6
Fish/Station	14	79	164		981	608	892	820	3558
Fish/Station/0.1 Mile									

GLOSSARY

Benthic	-	Bottom dwelling
Biomass	-	Living weight per unit area
Demersal	-	More dense than water
Detritus	-	Finely divided settleable material suspended in water
Epifaunal	-	Living on a substrate
Menzies trawl	-	A substrate interface sampling device consisting of a fine mesh net suspended in a flattened metal frame
Peterson Grab	-	Bottom sampling device consisting of 2 hinged buckets which when actuated samples a semi-circular cross-section of the substrate
Secchi Disc	-	A device used for measuring water turbidity. Usually a white disc which is lowered to point of disappearance
Van Veen Grab	-	Bottom sampling device, similar in design to Peterson grab